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TM 8-230

TECHNICAL MANUAL

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ARMY MEDICAL DEPARTMENT HANDBOOK OF BASIC NURSING

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HEADQUARTERS, DEPARTMENT OF THE ARMY

NOVEMBER 1970

ACKNOWLEDGEMENTS

Grateful acknowledgement is given to the following for permission to use certain materials or illustrations in this manual:

Becton-Dickinson and Company, Rutherford, N.J.

Bird Corporation, Palm Springs, Calif.

J. H. Emerson Company, Cambridge, Mass.

King, B. G. and Showers, M.J.: Human Anatomy and Physiology, 5th edition, Philadelphia, Pa., W. B. Saunders Company, 1963.

Leifer, Gloria: Principles and Techniques in Pediatric Nursing, Philadelphia, Pa., W. B. Saunders Company, 1965.

Puritan-Bennett Corporation, Kansas City, Mo.

Stryker Corporation, Kalamazoo, Mich.

The Purdue Frederick Company, Yonkers, N. Y.

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Washington, D.C. 20402

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TECHNICAL MANUAL
No. 8-230

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., *1 November 1970*

ARMY MEDICAL DEPARTMENT HANDBOOK OF BASIC NURSING

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* This manual supersedes TM 8-230, 8 May 1961, including all changes, and together with FM 21-11, 28 May 70, supersedes FM 8-30, 6 June 1957, including all changes.

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CHAPTER 1

INTRODUCTION

Section I. GENERAL

1-1. Purpose and Scope

This manual is for use in training medical corpsmen, MOS 91A10; medical specialists, MOS 91B20; and clinical specialists, MOS 91C20, in the nursing aspects of medical care and treatment. It also serves as a ready reference for use by other Army Medical Department units and activities.

1-2. Users' Comments

Users of this manual are encouraged to submit recommended changes or comments to improve the manual. Comments should be keyed to the specific page, paragraph, and line of the text within the paragraph in which the change is recommended. In some involved procedures, it may be necessary to refer to a subheading and a number within the subheading. Reasons should be provided for each comment to insure understanding and complete evaluation. Comments should be prepared using DA Form 2028 (Recommended Changes to Publications) and forwarded direct to Commandant, U.S. Army Medical Field Service School, Brooke Army Medical Center, Fort Sam Houston, Tex. 78234.

Section II. DEVELOPMENT OF THE ARMY MEDICAL DEPARTMENT

1-3. General

As a medical soldier you belong to a branch of the Army with a long history of service and achievement. It is not practical to include in this manual the whole story of the Army Medical Department, but as matters of special interest to you, some of the more important events in its development are summarized below.

1-4. The Revolutionary War

a. When the forces of the thirteen colonies united under one command on 14 June 1775, the United States Army was created. On 27 July 1775, the Continental Congress established a Hospital Department in the Army to care for the sick and wounded. The Hospital Department was composed of 1 director general and chief physician, 4 surgeons, 1 apothecary, 20 surgeon's mates, 1 clerk, 2 storekeepers, 1 nurse for every 10 patients, and incidental laborers as needed. That small organization was the Army's first step toward a central medical service.

b. The Hospital Department functioned throughout the Revolutionary War, but it was not the Army's only medical service. The Army was divided into several military departments and each department maintained its own medical service. Altogether about 1,200 medical practitioners joined the American colonists in their fight for freedom. Their efforts to provide adequate medical service were heroic but unsuccessful. There was no organized system of evacuating casualties. Treatment facilities were few and poorly equipped. Methods for prevention and control of communicable diseases were practically unknown. Many more soldiers died of disease than of battle wounds. But Army doctors came out of the Revolutionary War with new knowledge of treatment of the sick and wounded and of military sanitation.

1-5. The War of 1812

The Hospital Department, disbanded at the end of the Revolutionary War, was reactivated during the War of 1812. During this war, medical officers for the first time were given uniforms and the first Army Regulations on duties of medical officers were issued. Still the Hospital Department was hampered by lack of centralized control of medical facilities and by shortages of supplies and personnel. Many of the same shortcomings in

medical service experienced by the Army during the Revolutionary War were evident in the War of 1812.

1-6. Establishment of Army Medical Department

The year 1818 marked the beginning of a central medical organization in the Army. Congress reorganized the staff departments of the Regular Army and included in it a Medical Department to be headed by a Surgeon General. General Orders dated 21 April 1818 actually established the Medical Department. Since then medical service in the Army has maintained status as a staff department directed by a Surgeon General.

1-7. Organization of Medical Enlisted Force

The Army's first organized medical enlisted force was created in 1856 when Congress authorized the appointment of hospital stewards in the Medical Department. Hospital stewards were qualified noncommissioned officers who served as pharmacists, property men, record keepers, and wardmasters. They were assisted by enlisted men detailed from the line who served as nurses and attendants and received extra pay for this work.

1-8. The Civil War

During the Civil War, as in earlier wars, disease and wound infection were greater killers than gunfire. Nevertheless, important developments in combat medical service were produced. Among these were the field hospital; a better system of medical supply; the first convalescent camp; and the most outstanding, a system of evacuating battle casualties. The system was devised by an Army doctor, Jonathan Letterman. It included the use of field aid stations, ambulances, field hospitals, hospital trains, and general hospitals. Tried first at the Battle of Antietam in 1862, the Letterman Plan proved so efficient that it was adopted Armywide. The general principles of this system of evacuation are still in use.

1-9. Establishment of the Hospital Corps

During the peacetime period, 1865 to 1898, the event of greatest interest to medical enlisted men occurred in 1887 when the Hospital Corps was established in the Medical Department. Thus, for the first time men could be enlisted and trained exclusively for permanent duty with the Medical Department. The Hospital Corps was composed at first of hospital stewards, assistant hospital stewards, and privates. The title "hospital steward" was eliminated in 1903 when the corps was reorganized to consist of sergeants first class, corporals, privates first class, and privates.

1-10. Developments Between 1898 and 1916

The Spanish-American War in 1898 required a rapid expansion of the Army. This expansion, plus a devastating typhoid epidemic and an outbreak of yellow fever that occurred about that time, soon resulted in a shortage of medical personnel. To combat the yellow fever threat, Major Walter Reed and Major William C. Gorgas conducted extensive research in Cuba that resulted in proof that yellow fever was, in fact, transmitted by the mosquito. This made it possible to initiate effective control measures for this disease for the first time. To alleviate the shortage of medical personnel, trained female nurses were hired under contracts. Those nurses who remained in service after the war were organized into the Nurse Corps (female) in 1901. That year also saw the hiring of contract dentists. In fact, the basic organization of the Medical Department was revised during this period, and for the first time the department had a broad framework on which to prepare for war. An act in 1908 again reorganized the Medical Department and provided for a Medical Reserve Corps. A Dental Corps was attached to the Medical Department in 1911, and a Field Service and Correspondence School of Medical Officers was initiated at Fort Leavenworth. This was followed in 1912 by an act that officially recognized the American Red Cross and authorized its cooperation with the Sanitary Sevices; in 1916 sanitary trains were prescribed for divisions, corps, and armies, and the Veterinary Corps became a part of the Medical Department. In addition, in 1916, the old Hospital Corps was reorganized into a Medical Department enlisted force.

1-11. World War I

a. When the United States entered the war on 6 April 1917, the Medical Department began an unprecedented expansion of its personnel and activities. Two separate types of medical service were established—(1) medical service in a theater of operations and (2) medical service in the zone of interior. A Sanitary Corps was organized with officers commissioned from enlisted or civilian ranks. Although not professional medical men, the officers had training which made them valuable in sanitary engineering, laboratory work, medical

administration, or supply duties. The Sanitary Corps was the forerunner of the Medical Administrative Corps created in 1920. During World War I, the Medical Department reached a total strength of about 350,000, while the Army grew from 100,000 to a peak of 4 million men in 1918.

b. The great size of the Army, the vast scale of combat operations, and the remoteness of the battlefronts posed new and complex military medical problems. Nevertheless, the Medical Department gave outstanding service in both the United States and the theaters of operations. Besides giving medical treatment to the sick and wounded, the Medical Department made a fine record in the control of diseases among Army personnel in World War I. Despite a devastating influenza epidemic, the ratio of deaths due to diseases to deaths due to battle action was reduced to only slightly more than one to one. World War I produced other advances in Army medicine. Casualty evacuation was improved. Mobile hospitals and surgical teams were introduced. The wounded got better and faster medical treatment. In surgery two types of wound treatment came into use, debridement and antiseptic treatment with chlorine solutions.

1–12. World War II

a. World War II brought with it a return, on a much larger scale, of many of the problems encountered in World War I. It brought new medical problems, too, such as those involved in the amphibious and aerial invasion of Europe. This time the nation fought a global war, the peak strength of the Army reached eight million men, and the war lasted 4 years.

b. During World War II, the Medical Department reached a total strength of more than 600,000. In 1942, members of the Army Nurse Corps were granted relative military rank. Other female officers were commissioned in the Medical Department in the specialties of physical therapy and dietetics. In 1943, the Pharmacy Corps was established. Nonregular Army members of the Medical Administrative Corps, like the Sanitary Corps, became a reserve component. Regular Army members of the Medical Administrative Corps became members of the Pharmacy Corps.

c. The conduct of large scale combat operations in widely separated areas of the world resulted in an unprecedented variety of medical problems. Yet the service given by the Army Medical Department in World War II surpassed all previous records of success in military medicine. For the first time, deaths due to disease were less than deaths due to battle injuries. This was true despite that fact that deaths from wounds were kept to a new low.

d. Many wartime advances in medical service contributed to the Medical Department's success in conserving Army fighting strength. Great improvements were made in methods of evacuating casualties. Ambulances, hospital ships, and hospital trains were used more than ever before. New means of air evacuation were introduced, and by the end of the war, air evacuation of casualties was common practice. There was better management of wounds at all levels of medical service, especially in forward combat areas. Penicillin and improved surgical techniques virtually eliminated wound infection. Plasma and blood transfusions were used widely and saved many lives. Methods of treatment of burns improved as the war progressed. Psychiatry was used more widely than ever before to maintain the mental health of troops.

e. Perhaps the most impressive developments in Army medical service during World War II were those in preventive medicine. The Medical Department developed and applied many measures for the prevention and control of disease to safeguard the health of the Army. One of the most significant measures was the use of DDT in the control of malaria. Other disease prevention measures included sanitary surveys of all sites chosen for military installations; use of halazone tablets and the diatomaceous earth filter for water purification; health education for individual control of disease; and immunization agents for typhus fever, yellow fever, typhoid, cholera, and several other diseases. The drug, atabrine, was found to be an effective substitute for quinine in the treatment of malaria. The discovery of new drugs for the treatment of cholera, amebiasis, filariasis, and schistosomiasis also contributed to disease control.

1–13. Postwar Medical Service

After World War II, the Medical Department, like all of the Army, was reduced in numbers. But its responsibilities continued to be global. Medical support was furnished wherever our military forces were stationed. Progressive training of medical service personnel was resumed on a peacetime basis, and research and development of new equipment were continued. In 1947, Congress

established two new corps in the Regular Army Medical Department: the Medical Service Corps, which replaced and incorporated the former Medical Administrative, Sanitary, and Pharmacy Corps; and the Women's Medical Specialist Corps, which included dietitians, physical therapists, and occupational therapists. Then the Army Organization Act of 1950 specified that medical service in the Army would consist of The Surgeon General, the Assistant Surgeons General, the Medical Corps, the Dental Corps, the Veterinary Corps, the Medical Service Corps, the Army Nurse Corps, and the Women's Medical Specialist Corps (redesignated in 1955 the Army Medical Specialist Corps). These components, collectively, were officially named the "Army Medical Service." Since 1955 the entrance of men into formerly all-female components has been authorized. Qualified male nurses are commissioned in the Army Nurse Corps; and qualified male dietitians, physical therapists, and occupational therapists are commissioned in the Army Medical Specialist Corps. Under Public Law 90-329, 4 June 1968, the Army Medical Service was redesignated the Army Medical Department.

1-14. Army Medical Service in Korea

With the outbreak of war in Korea and the concurrent expansion of the Army, medical field service training was resumed on a full-scale basis. Thousands of Army Medical Department officers and enlisted men were prepared for and assigned to duty overseas. An important development of this period was the use of helicopters for ambulance service. Casualties who could not be evacuated by other means were brought to medical treatment facilities by helicopter in the shortest possible time. This saved many lives which otherwise may have been lost. Since then, helicopter ambulance units have become a permanent element of the Army Medical Department. Rapid evacuation of casualties, the efficient use of latest developments in medicine, and the teamwork of medical personnel made possible the saving of 97.4 percent of the wounded who survived long enough to be brought to a frontline treatment facility—surpassing by 2 percent the life-saving record established by the Medical Department in World War II.

1-15. Army Medical Department in Vietnam

The conflict in Vietnam has seen the increased use of evacuation of wounded by helicopter. Since no casualty is more than 30 minutes flying time from receiving definitive medical care, the morality rate has been reduced. Other medical advances include the development of the MUST hospital and air evacuation to CONUS.

Section III. INTERPERSONAL RELATIONSHIPS

1-16. Definition

Interpersonal relationships are defined as interactions that take place between individuals and other individuals and groups. There are two kinds of interaction—actions and reactions, or cause and effect. When these interactions unite individuals and groups into teams whose members mutually support one another to accomplish their goal, good interpersonal relationships have been developed. Since the goal of the medical service is to restore a patient to physical and mental health, good interpersonal relationships among hospital personnel and between hospital personnel and patients are essential.

1-17. Importance of Good Interpersonal Relationships

It would be a mistake to think that good interpersonal relationships apply only in wards, clinics, and other treatment units. This practice applies throughout, including the reception area and the information desk. Through good interpersonal relationships, the patient receives the total physical and mental care that team effort can provide. Authoritative studies have shown that patients sense and react to the harmony or lack of harmony shown by members of a patient care team as they perform their duties. Personnel who work well with their own group and with others experience a feeling of harmony and job satisfaction which is communicated to their patients. As a result of this feeling, patient care improves. When a patient feels secure and accepted and has confidence in the team effort of personnel caring for him, he is motivated to help himself toward recovery. Thus, good interpersonal relationships help all areas concerned with patient care.

1-18. Means of Developing Good Interpersonal Relationships

Development of good interpersonal relationships is not always easy. Not all medical service person-

nel elect Army service as a career, and not all are in the type of work that is their primary choice. The number of people involved in providing patient care on a 24-hour, 7-day-week basis creates problems of communication and understanding. Good relations are easier to describe than to achieve, and there are few never-fail formulas that apply in all situations. Some guidance can be given, however, as a means of developing good interpersonal relations—

a. Understanding Oneself. The foundation for good relations with others is a state of good relations with oneself. Self-understanding and self-acceptance based on a realistic picture of oneself and a genuine feeling of self-worth which is justified by performance should not be confused with smugness; they are ingredients of an effective relationship with others. Just as each is a unique person, each must accept the right of another person to differ within socially sanctioned limits. Thus in any instance in which relationships are less than the best, each person must first look to himself to see if he has contributed to the faulty relations.

b. Understanding the Line of Authority. Each member of the patient care team should clearly understand his responsibilities and authority. He should observe the prescribed organizational relationships both in accomplishing his own assignment and in assisting others. Each person functions most effectively when he works within the limitations prescribed for him.

c. Understanding the Need for Orientation of Patients. Since most inpatients and many outpatients experience a distinct feeling of a loss of control over what is happening to them, all medical service personnel who come into face-to-face contact with patients should be considerate of them. They need kindness, sympathy, and simple courtesy, as well as technical competence. In fact, it is their right to receive competent care cheerfully given. If they know what to expect from medical service personnel and what the medical organization expects of them, they will be less apt to become apprehensive, critical, or demanding. Orientation is essential for cooperation.

1–19. Summary

A more extensive review of accepted principles of human behavior and additional guidance for developing good relationships among hospital personnel and patients are provided in DA Pam 8–13. In essence, however, interpersonal relations must be considered as part of a continuing program of learning how to get along with *people*, people who are patients and people who work in the hospital.

Section IV. LEGAL ASPECTS OF MEDICAL CARE AND TREATMENT

1–20. General

a. Legal aspects of medical care and treatment are covered briefly here in order to alert Army Medical Department enlisted personnel who will be assigned to patient care duties involving medical and nursing activities to the importance of law as it pertains to the provision of medical care and treatment. Since this is a broad topic, this discussion is limited to introductory information concerning: (1) the legal status of a medical service patient care team member; (2) some medical-legal problems that arise when, in the course of assisting with medical care and treatment, something is done that interferes with the rights and privileges of a patient; (3) professional practices acts; and (4) the Federal Torts Claim Act (FTCA).

b. The public has special trust and confidence in medicine and allied professions and in the institutions and organizations that provide medical care and treatment. Since laws are written primarily to safeguard the public welfare, those that apply to the provision of medical services have special significance. The fact that incompetence in the provision of medical services could result in the loss of health or even of life is recognized.

c. Law can be defined as a rule of conduct pronounced by a controlling authority which may be enforced by means and remedies provided by the law. Three distinguishing characteristics of a law are—(1) someone or some agency has the authority or right to declare a rule exists, (2) the rule pronounced and its source can be identified, and (3) a right to enforce the law is provided.

1–21. Law and the Medical Soldier

a. Enlisted personnel have been instructed on their legal status as a soldier in FM 21–13, and have been reminded that they are subject to and protected by both civilian and military law. They have been reminded also that, although they do

not have to know all the details of military law to be a law-abiding solider, they do have to be informed of those portions of the Uniform Code of Military Justice which govern their conduct as soldiers.

b. The medical soldier is authorized to perform his military-medical duties under the conditions established for the performance of those duties. His legal protection and legal status are established when he works: (1) within the scope of his duties, as defined by AR 611-201; (2) within the limits of his training; and (3) in accordance with the policies established for the performance of his duties by his local medical commanding officer. Army regulations (AR's) that pertain to the provision of medical services in Army Medical Department treatment facilities are the AR 40-series.

c. Under the provisions of AR 40-1, the duties and responsibilities of *professionally* qualified personnel assigned to Army Medical Department facilities are defined. The range of duties within the enlisted MOS includes activities that are universally accepted as professional medical and nursing acts. *For example,* any activity involving remedial treatment of a patient is a medical act and many nursing activities are conditioned or dependent upon the order and direction of a physician. The practice of medicine is strictly controlled by licensure, but medical practice acts also permit *delegation* of certain *medical activities* providing certain conditions are met. The legal right to perform acts defined as medical acts is conditioned upon (1) training and skill, which give the ability to understand the cause and effect of the act performed; (2) the act being performed on the order of a physician; and (3) the direction and supervision of the act remaining the responsibility of the physician. Examples of specific medical acts in the range of duties perscribed for MOS 91B and 91C are administering intravenous fluids, administering drugs, and catheterizing the urinary bladder. Since these same duties performed by a professional nurse are still medical practice acts, the professional nurse's right to perform these duties is also conditioned by the order, direction, or supervision of a physician. In general, remember that *diagnosing, prescribing,* and *treating* are medical acts.

d. Nursing functions and activities that medical specialists will be responsible for are even more difficult to summarize than medical functions. Examples of established nursing functions that a *nonprofessional* performing a nursing function will be expected to do include—

(1) Environmental and physical management of the patient, providing suitable surroundings and personal hygienic measures for safety and comfort.

(2) Factual observation, reporting, and recording of physical signs and symptoms.

(3) Performance of selected clinical nursing procedures, with an understanding of cause and effect, in support of medical orders.

(4) Assistance in medical examinations, treatments, and diagnostic tests and procedures under the direction and supervision of the medical officer.

e. Medical specialists are subject to assignment to Army Medical Department treatment facilities to carry out nursing activities in units that function without assigned nurses. Under the Medical Department Activity (MEDDAC) concept, the Chief, Department of Nursing/Nursing Service of the medical treatment facility is responsible for the nursing services required to support the various medical treatment programs. It is through this channel that the medical specialist has access to nursing supervision, consultation, and guidance.

1-22. Negligence as a Medical-Legal Problem

a. There is no one uniform code of medical law, but there are laws that have special significance in medical care and treatment areas. A basic rule of law that applies in the provision of all medical services is the *rule of negligence.* Every one, military and civilian, professional and nonprofessional, has an absolute duty to conduct himself and his property so as to avoid injury to the person or property of others. Although the spirit of service to others is a key principle in the performance of all medical duties, there are responsibilities that extend beyond being kind and thoughtful in the provision of services. When services are provided, there is *an obligation to use due care* to be sure that the patient is not injured by negligence, which can be defined simply as failure to exercise due care in relation to a person to whom care is due. A more complicated legal definition of negligence is the doing or failure to do the act, pursuant to a duty, that a reasonable person in the same or similar circumstances would or would not do and the acting or nonacting is the proximate cause of injury to another person or to his property.

b. The law holds every individual responsible for his own acts of negligence. Negligence is commonly held to be an unintentional injury, but once an act has been performed and injury results, the performance of the act and the consequence of the act are facts. Thus, negligence is one of the most common causes for law suits against hospitals and hospital personnel. Examples of negligence include injuries caused by use of faulty equipment, burns from applications of hot water bottles and other heating devices, medication errors, falling out of bed, and careless handling of sponges and instruments in operating rooms.

c. The law of negligence applies in almost all medical-legal problems that arise when, in the course of medical treatment, something is done that interferes with the rights and privileges of a patient. However, under our form of government there is legal recognition of unforeseeable, unavoidable, or inevitable accidents. Responsible authority provides for investigation to establish the facts of an accident or incident, and the facts are usually obtained when five questions are asked: when? where? who? what? how? These questions are not asked to establish guilt or innocence but to establish the facts on which a legal decision can be made.

d. Personnel assigned to an Army Medical Department treatment facility should all know that there is a special form (DA Form 8–249, Report of Unusual Occurrence) to be completed whenever a patient is involved in an accident that may or may not have caused injury.

(1) The responsible individual in charge of the ward or area completes DA Form 8–249 whenever a patient is involved in an unusual occurrence or accident. The accident and circumstances should be described in detail for the protection of the patient and the hospital staff.

(2) The medical officer, ward officer, or appropriate medical officer of the day (MOD) must be notified immediately. Local policy will govern who is to receive the report; this is usually the hospital commander, but it may be the administrative officer of the day (AOD), chief of the clinical service, chief nurse, or appropriate nurse supervisor. When indicated, the original of the report is then filed with the patient's permanent clinical record.

1–23. Professional Practice Acts

a. Professional practice acts are laws that control the practice of legally recognized professions. The purpose of these acts is to protect the public from persons unqualified to practice. In general, professional practice acts (1) define the profession; (2) provide standards that control the preparation for practice; (3) provide for licensure; and (4) through licensure, define by law who shall be licensed to practice and under what terms. A license is a legal document that permits a person to offer to the public his skills or knowledges in a field where such practice would otherwise be unlawful without a license. Licensure provides for rights and responsibilities, and thus a major responsibility of a person licensed to practice a profession is that this person must act with the skill and care normally expected of a person claiming professional competence.

b. There is no uniform Federal professional practice act, so requirements for licensure under professional practice acts vary from State to State. This is because, under the Constitution, each State is responsible for passing its own laws regulating the control of professions, trades, and occupations.

c. A question often asked is—What is the legal status of graduates of the Army Medical Department course for clinical specialists, MOS 91C20? At the present time, licensure as a practical nurse is not essential to effective performance of duty as a clinical specialist in Army Medical Department facilities. Some States accept graduates of the course for examination for licensure as a practical nurse, so there is civilian legal recognition of the special skills and training of the clinical specialist. Licensure is also a benefit to the individual as a private person. One desired goal is that each school conducting the Clinical Specialist Course will be accredited by the appropriate State licensure board for practical or vocational nurses. This goal agrees with the aims of the Army Classification System, providing that, at the same time, the manpower requirements of the Army are met.

1–24. The Federal Torts Claim Act

a. The Federal Torts Claim Act (FTCA) became effective in the United States in 1946. The FTCA permits legal action against the Federal Government on damage claims "for injury or loss of property, or personal injury or death caused by the negligent or wrongful act or omission of any employee of the government while acting within the scope of his office or employment, under circumstances where the United States, if a private person, would be liable to the claimant in accordance with the law of the place where the act or

omission occurred." The phrase "employee of the government" includes members of the military forces, while "scope of his office or employment" for military forces is defined to mean acting in line of duty. The term "tort" used in the title of the act is a legal term for a private wrong for which a court of law will award a remedy of damages. An example of a tort is negligence.

b. The FTCA specifically *excluded* certain claims for negligence. Among these exclusions are the following:

(1) Claims arising from combat activity of military forces during war.

(2) Claims arising in a foreign country.

(3) Claims arising from the exercise of discretionary functions relating to policy or interpretation.

(4) Claims arising from service-connected injuries. However, relatives of service men can sue for their own injuries.

(5) Claims arising from activities during disaster situations.

c. In the FTCA, the Federal Government consents to liability for the negligence of its employees when committed in the course of their employment with certain exceptions, some of which are listed in *b* above. FTCA is based upon the rule of law, "respondeat superior" or "let the master answer." However, this rule does not absolve the employee from liability. It simply permits the injured party to sue both the employer and the employee on the basis that a distinguishing characteristic of an employer-employee relationship is the retention by *the employer of control over the employee's activities.*

d. Military personnel who are sued individually or jointly with the United States will have their defense arranged through regular channels provided by the Office of the Judge Advocate General. All reports are made in accordance with Army regulations and are submitted to the Department of the Army. All claims are handled through authorized military legal channels.

e. The fact that a patient can or cannot sue the Government for injuries resulting from negligence should have no bearing on the quality of care he receives. High standards of care are the right of the patient and an obligation of the Army Medical Department. This policy implies both legal and ethical responsibility.

CHAPTER 2

ANATOMY AND PHYSIOLOGY

Section I. BASIC CONCEPTS

2–1. General

The science of anatomy is the study of the structure of the body, its organs, and the relation of its parts. There are many subdivisions or branches of this science. Physiology is the study of the functions and activities of the parts of the body. This science also has many subdivisions. In this chapter both anatomy and physiology will be presented in the discussion of the structure and function of the various systems of the human body, all of which are closely interrelated and interdependent.

2–2. Cells

The cell is the basic functioning unit in the composition of the human body, as well as in all other living organisms. The human body is composed of billions of cells which vary in shape and size. Cells are microscopic in size, however, the largest being only about 1/1000 of an inch. Because of this, a special unit of measurement, the micron, is used to determine cell dimensions. (One micron equals 1/1000 millimeter or about 1/25,000 of an inch.) A group of the same type of cells is called a tissue and performs a particular function. The human body is composed of many groups of cells performing a variety of functions.

a. Cells reproduce to replace wornout cells, to build new tissues, and to bring about the growth of the body as a whole. Cells reproduce themselves or increase by dividing, maturing, and dividing again. This process is known as growth by division. It results in a mass of apparently identical cells; however, as cell division continues, differences begin to appear in various groups of cells as they develop the characteristics necessary for them to perform their roles in the development and functions of the body. This development of special characteristics is called *cell differentiation.*

b. Cells are composed of a substance called protoplasm. A typical animal cell (fig. 2–1) is made up of a cell membrane and two main parts—the *nucleus* and the *cytoplasm,* which are types of protoplasm. The *nucleus* controls all activities of the cell, including growth and reproduction. *Cytoplasm* is the matter surrounding the nucleus and is responsible for most of the work done by the cell. The cell membrane incloses the protoplasm and permits the passage of fluid into and out of the cell. This permeable cell membrane is an important structural feature of the cell. It is through the cell membrane that all materials essential to metabolism are received and all products of metabolism are disposed of. The bloodstream and tissue fluid which constantly circulate around the cell transports the materials to and from cells.

(1) *Metabolism* is the ability to carry on all the chemical activities required for cell function. It includes using food and oxygen, producing and eliminating wastes, and manufacturing new materials for growth, repair, and use by other cells.

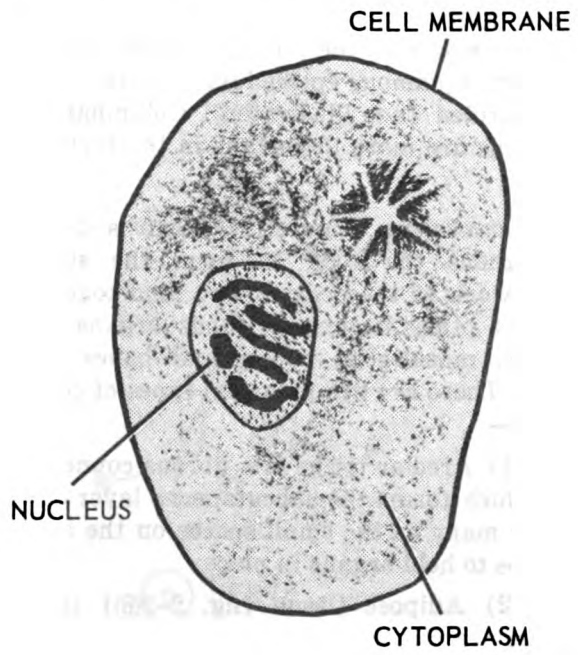


Figure 2–1. Simple cell.

(2) *Tissue fluid* is the body fluid that lies outside blood vessels and outside cells and is therefore also called *extravascular* (outside blood vessels) or *extracellular* (outside cells) fluid. Living body cells contain large amounts of water and must be bathed continuously in a watery solution in order to survive and carry on their functions. The colorless and slightly salty tissue fluid is derived from the circulating blood.

2-3. Tissues

A tissue is a part of the body made up of similarly specialized cells which work together to perform particular body functions. There are four main types of tissues, each of which has a particular function (fig. 2-2).

a. Epithelial. Epithelial tissue forms the outer layer of skin for the protection of the body. It is also a lining tissue. As *mucous membrane,* it lines the nasal cavity, mouth, larynx, pharynx, trachea, stomach, and intestines. As *serous membrane,* it lines the abdominal, chest, and heart cavities and covers the organs that lie in these cavities. As *endothelium,* it lines the heart and blood vessels. It lines respiratory and digestive organs for the functions of protection and absorption. It helps form organs concerned with the excretion of body wastes, certain glands for the purpose of secretion, and certain sensory organs for the reception of stimuli. Based on the shape of the cells, there are 3 types of epithelial tissue (fig. 2-2Ⓐ). As illustrated, squamous (flat) epithelial cells in a single layer compose such structures as the microscopic air sacs of the lungs; in other places as in the skin, squamous epithelium is in several layers or stratified (not illustrated). Columnar epithelium cells are more important in the formation of ducts.

b. Connective. Connective tissue is distributed throughout the body to form the supporting framework of the body and to bind together and support other tissues. It binds organs to other organs, muscles to bones, and bones to other bones. There are five principal types of connective tissue—

(1) Areolar tissue is a fibrous connective tissue which forms the subcutaneous layer of tissue. It fills many of the small spaces on the body, and it helps to hold organs in place.

(2) Adipose tissue (fig. 2-2Ⓑ) is a fatty connective tissue which is found under the skin and in many other regions of the body. It serves as a padding around and between organs. It insulates the body, reducing heat loss, and it serves as a food reserve in emergencies.

(3) Reticular tissue is a fibrous connective tissue which forms the supporting framework of lymph glands, liver, spleen, bone marrow, and lungs.

(4) Elastic tissue is a fibrous connective tissue composed of elastic fibers and is found in the walls of blood vessels, in the lungs, and in certain ligaments.

(5) Cartilage (fig. 2-2Ⓑ) is a tough, resilient connective tissue found at the ends of the bones, between bones, and in the nose, throat, and ears.

c. Muscular. Muscular tissue is composed of long, slender cells held together by connective tissue. There are three kinds of muscle tissues: striated, smooth, and cardiac (heart muscle). Muscle tissue has the ability to contract (shorten) and, by so doing, to produce movement.

(1) Striated muscle has striations (its fibers are divided by transverse bands) (fig. 2-2©) when viewed through a microscope. Because most striated muscle attaches to bones, it is often referred to as skeletal muscle. Skeletal muscle contraction is stimulated by impulses from nerves and, in theory, the nerve impulses can be controlled by voluntary or conscious effort. Skeletal muscle tissue is therefore referred to as striated, voluntary muscle tissue.

(2) Smooth muscle which has no striations when viewed through a microscope (fig. 2-2 ©), is found in the walls of internal organs (viscera), blood vessels, and internal passages. Contraction of smooth muscle helps propel the contents of internal structures along. Smooth muscle contractions are stimulated by nerve impulses not under conscious control. Smooth muscle is therefore referred to as visceral, nonstriated, involuntary muscle.

(3) Cardiac muscle (fig. 2-2©) is found only in the walls of the heart; i.e., myocardium is heart muscle.

d. Nervous. Nervous tissue is composed of cells highly specialized to receive and transmit impulses (messages). These nerve cells, which are called neurons (fig. 2-2Ⓓ), are bound together by a special structure called neuroglia.

2-4. Organs

An organ is a group of tissues which has combined to perform a specific function. The body is

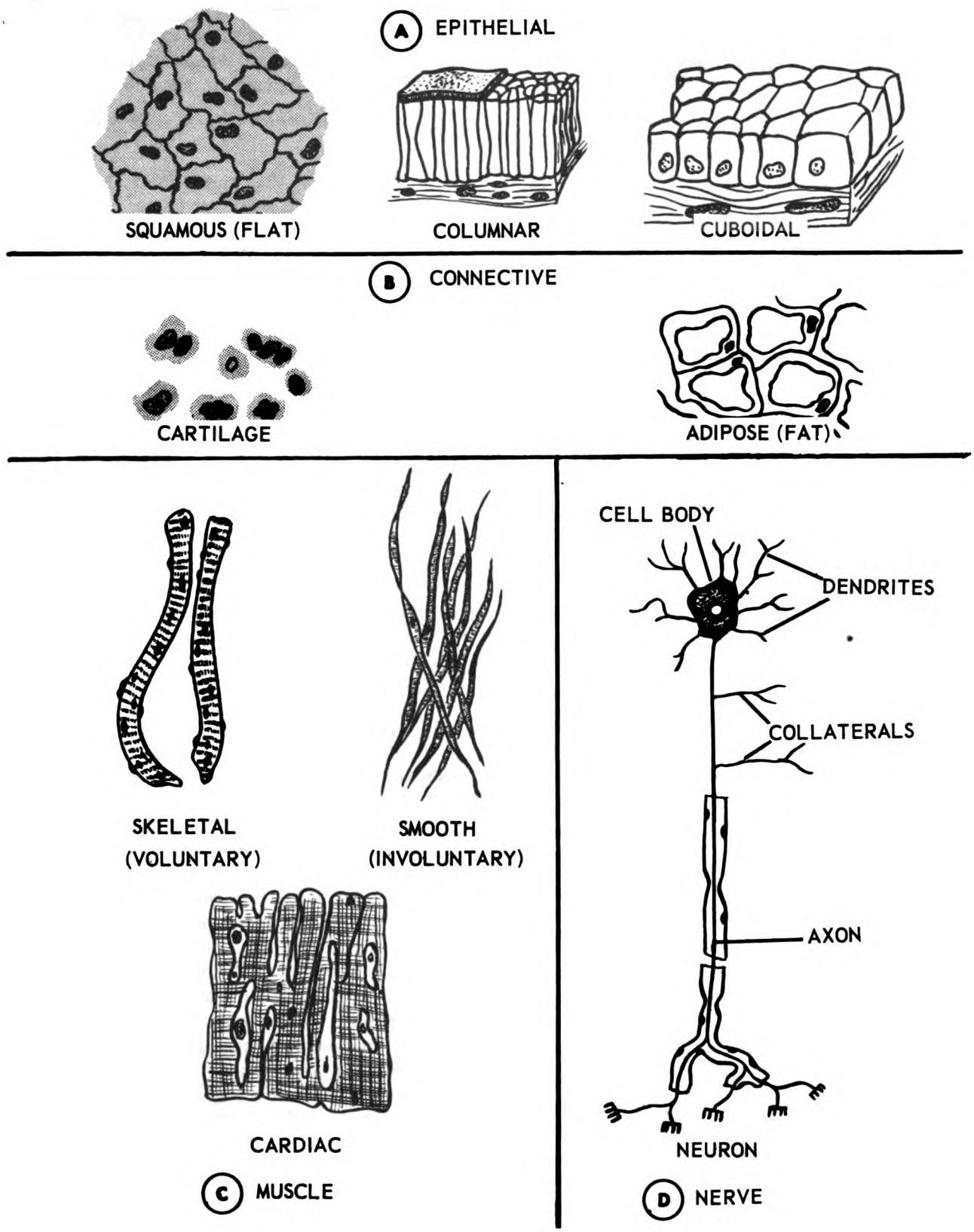


Figure 2–2. Types of tissues.

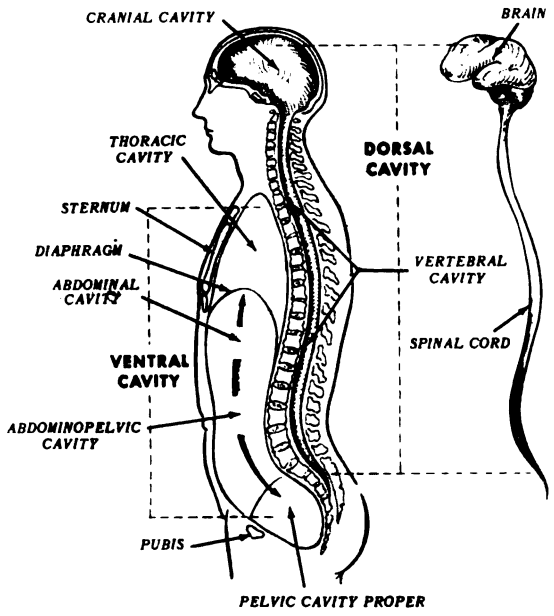


Figure 2–3. Main body cavities.

composed of many organs, each with its own specialized function.

2–5. Body Cavities

The organs of the body are located in certain cavities, the major ones of which are the dorsal cavity (toward the back part of the body) and the ventral cavity (toward the front part of the body) (fig. 2–3).

a. Dorsal Cavity. The dorsal cavity has a cranial area, which contains the brain, and a vertebral area, which contains the spinal cord. These areas are continuous.

b. Ventral Cavity. The ventral cavity has a thoracic cavity and an abdomino pelvic cavity. These areas are separated by the diaphragm.

(1) In the thoracic cavity are two pleural cavities, each containing a lung. In the space between the pleural cavities is the pericardial cavity, which contains the heart, and the mediastinal region, in which are contained the trachea, esophagus, thymus gland, large blood and lymphatic vessels, lymph nodes, and nerves.

(2) In the upper part of the abdomino pelvic cavity are the stomach, small intestine, liver, gallbladder, pancreas, spleen, kidneys, adrenal glands, and ureters. The lower part of the cavity (pelvic cavity) contains the urinary bladder, the end of the large intestine (rectum), and parts of the reproductive system.

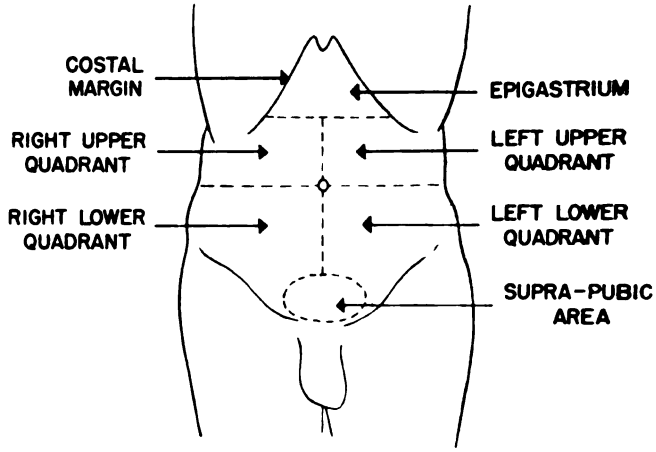


Figure 2–4. Areas of the abdomen.

c. Anterior Abdominal Surface Area. The large anterior area of the abdomino pelvic cavity is divided into four parts or quadrants (fig. 2–4). Initials that identify quadrants are LUQ (left upper), RUQ (right upper), LLQ (left lower), and RLQ (right lower). These initials are often used to indicate the approximate location of an organ, pain, a wound, or a surgical incision. In addition to identification by quadrants, the upper central abdominal region is referred to as epigastric (over the stomach), and the lower central region as suprapubic (above the pubis). The rib area is called costal.

2–6. Membranes

Certain membranes are combined layers of tissue that form partitions, linings, envelopes, or capsules. They reinforce and support body organs and cavities. Others are a combination of connective tissues only (*examples:* mucous, pleural, pericardial, and peritoneal membranes). Connective tissue membranes are combinations of connective tissue only (*examples:* meninges, fascia, periosteum, and synovia). Different kinds of membranes are associated with different body systems (*examples:* pleural membranes with the respiratory system; pericardial membranes with the circulatory system; peritoneal membranes with the digestive system; meningeal membranes with the nervous system; fascial membranes with the muscular system; and periosteal and synovial membranes with the skeletal system).

2–7. Body Systems

The organs of the human body are arranged into major systems, each of which has its specific func-

tion to perform and all of which are interdependent. The body systems and their overall functions are—

a. Skeletal. This system provides the body framework, supports and protects body organs, and furnishes a place of attachment for muscles.

b. Muscular. This system moves and propels the body.

c. Skin. The integumentary system, or skin, covers and protects the entire body surface from injury and infection, has functions of sensation (heat, cold, touch, and pain) and assists in regulation of body temperature and excretion of wastes.

d. Circulatory. This system transports oxygen and nutrient material in the blood to all parts of the body and carries away the waste products formed by the cells.

e. Respiratory. This system takes in air, delivers oxygen from the air to the blood, and removes the waste (carbon dioxide) from the blood.

f. Digestive. This system receives, digests, and absorbs food substances and eliminates waste products.

g. Urinary. This system filters waste products from blood and excretes waste products in urine.

h. Nervous. This system gives the body awareness of its environment, enables it to react to stimuli from the environment, and makes the body work together as a unit.

i. Endocrine. This system controls many body activities by the manufacture of hormones which are secreted into the blood.

j. Reproductive. This system produces and transports reproductive (sex) cells.

Section II. ANATOMICAL AND MEDICAL TERMINOLOGY

2-8. Anatomical Terminology

Terms of position, direction, and location that are used in reference to the body and its parts include the following:

a. Terms of Position.

(1) Anatomical position—the body standing erect, arms at side, palms of hands facing forward. The anatomical position is the position of reference when terms of direction and location are used.

(2) Supine position—the body lying face up.

(3) Prone position—the body lying face down.

(4) Lateral recumbent—the body lying on the left or right side.

b. Terms of Direction and Location.

(1) Superior—toward the head (cranial).

(2) Inferior—toward the feet (caudal).

(3) Anterior—toward the front (ventral—the belly side).

(4) Posterior—toward the back (dorsal—the backbone side).

(5) Medial—toward the midline.

(6) Lateral—to right or left of midline.

(7) Proximal—near point of reference.

(8) Distal—far away from point of reference.

c. Body Regions. Terms of location in relation to body regions are shown in figure 2-5 Ⓐ and Ⓑ.

d. Anatomical Planes. Imaginary straight line divisions of the body are called planes. Medical illustrations and diagrams that indicate internal body structure relationships are labeled to indicate the plane division as—

(1) Sagittal—a lengthwise division, producing right and left sections.

(2) Transverse—a crosswise division, producing top and bottom sections.

(3) Frontal—a side-to-side division, producing front and back sections.

2-9. Medical Terminology

To understand most medical words, all that is necessary is to break the words into their parts and to know the meaning of these parts. Many medical words contain a stem or root to which is affixed either a prefix, a suffix, or both. A prefix is a group of letters combined with the beginning of a word to modify its meaning. A suffix is a group of letters added to the end of a word to modify its meaning. *For example,* the word "myocarditis"

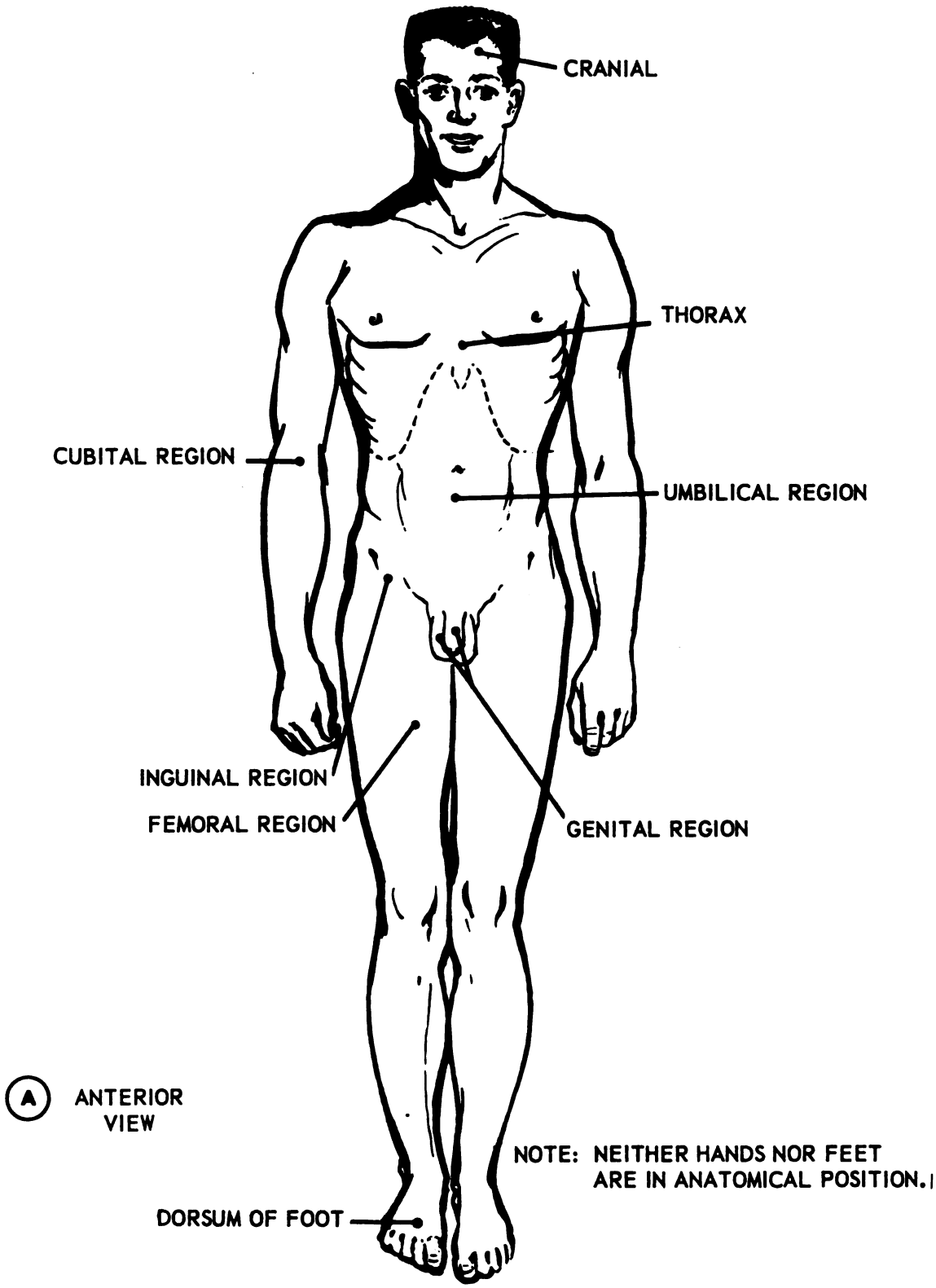


Figure 2-5. Names of body regions.

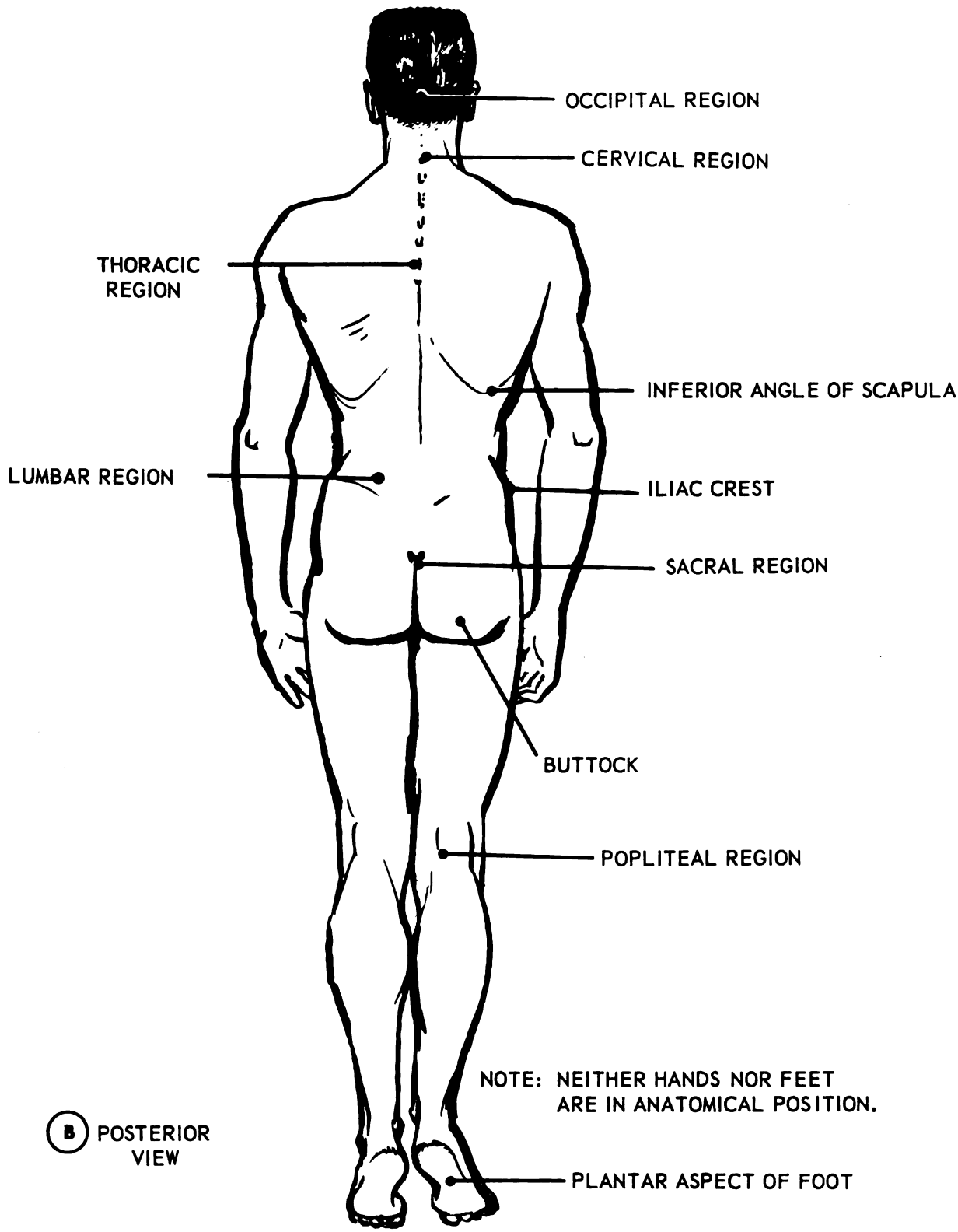


Figure 2–5—Continued.

consists of the prefix "myo," the stem "card," and the suffix "itis." Myo means "muscle." Card means "cardiac" or "heart." Itis means "inflammation." Thus, myocarditis means inflammation of muscles of the heart. Table 2-1 gives combining forms that are commonly used in medical terminology. These must be learned to understand medical references that will occur from now on.

Table 2-1. Medical Terminology

STEM WORDS	MEANING	PREFIX	MEANING	EXAMPLE OF USE IN MEDICINE	DEFINITION OF EXAMPLE	SUFFIX	MEANING	EXAMPLE OF USE IN MEDICINE	DEFINITION OF EXAMPLE
adeno	gland	a-, an-	absence of, deficiency	atrophy	shrinking, wasting away	-algia	pain	otalgia	ear ache
arthro	joint	endo-	inner, inside	endocardial	inside the heart	-ectomy	surgical removal	nephrectomy	surgical removal of a kidney
cardio	heart	epi-	upon, on the outside	epidermis	outside layer of skin	-emia	a condition of the blood	septicemia	blood poisoning
cephalo	head	hyper-	more than normal, over	hypertrophy	enlargement	-itis	inflammation	hepatitis	inflammation of the liver
cysto	bladder	hypo-	less than normal, under	hypotension	low blood preasure	-oma	a tumor, a swelling	adenoma	a glandular tissue tumor
cyto	cell	inter-	between	interneural	between nerves	-plasty	surgical repair	thoraco-plasty	surgical repair of the chest wall
dermo	skin	intra-	inside	intraocular	inside the eye	-scopy	looking into or through an instrument	cystoscopy	examination of the urinary bladder through a cystoscope
entero	intestine	peri-	surrounding	periosteum	membrane surrounding bone	-stomy	surgical opening creating a hole	gastrostomy	artificial opening into the stomach through the abdomen
gastro	stomach					-tomy	surgical incision	arthrotomy	incision into a joint
hemo	blood								
hepato	liver								
myelo	*spinal cord								
myo	muscle								
nephro	kidney								
neuro	nerve								
oculo	eye								
osteo	bone								
oto	ear								
procto	rectum								
thoraco	chest								
	*or bone marrow								

Section III. THE SKELETAL SYSTEM

2–10. Functions and Divisions
(fig. 2–6 Ⓐ and Ⓑ)

The skeletal system includes the bones and the joints (articulations), where separate bones come together. The skeletal system has several important functions, in addition to providing the bony framework of the body.

a. Skeletal System Function.

(1) To give support and shape the body.
(2) To protect internal organs.
(3) To provide movement when acted upon by muscles.
(4) To manufacture blood cells.
(5) To store mineral salts.

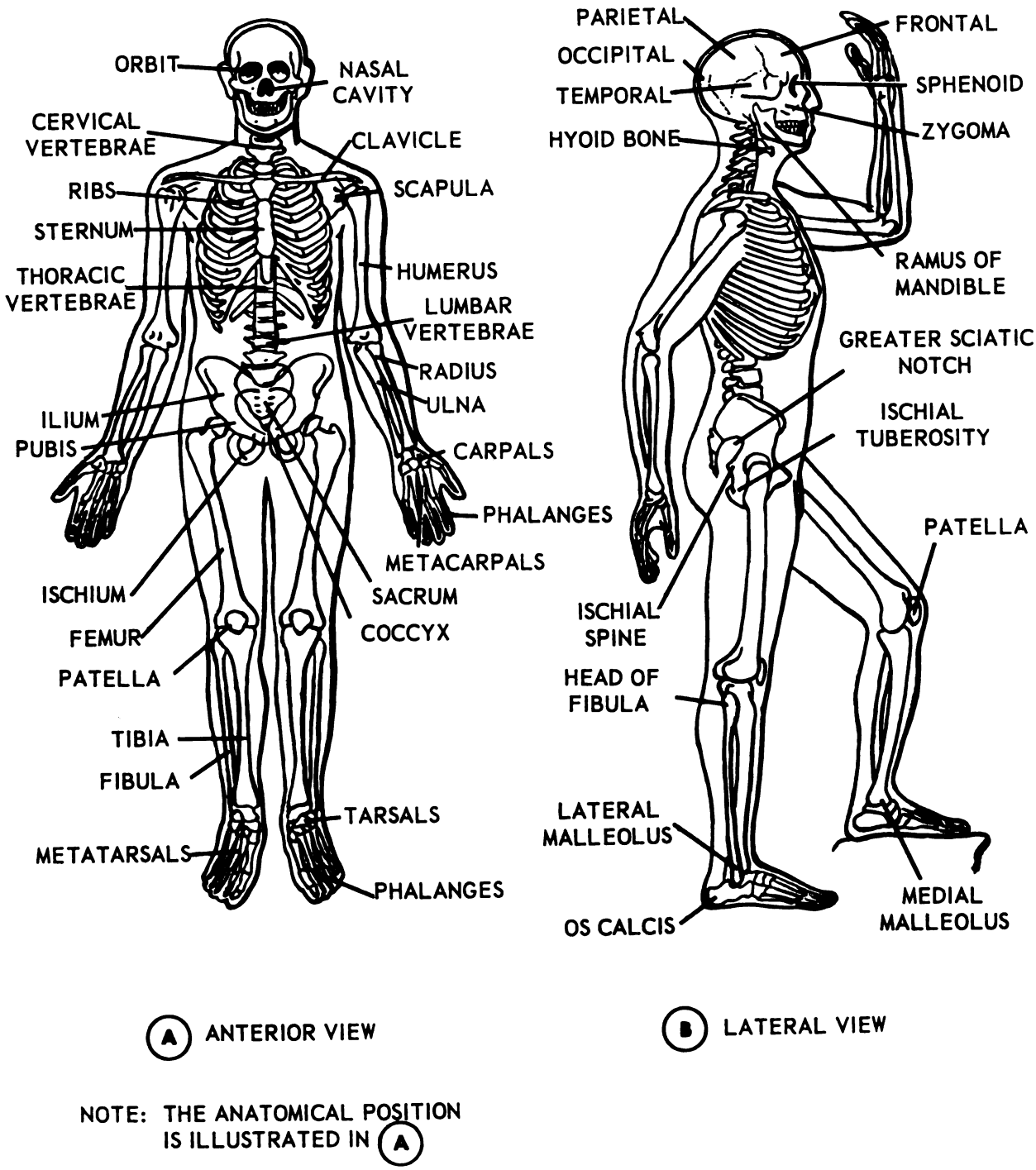


Figure 2–6. Human skeleton.

b. Divisions of the Skeleton. For study purposes, the 206 bones of the adult are divided into the bones of the axial skeleton (80 bones) and the appendicular skeleton (126 bones). The axial skeleton includes the skull, vertebral column, ribs, and sternum. The appendicular skeleton includes bones of the shoulder girdle, upper limb, the pelvic girdle, and lower limb.

2-11. Bone Structure and Shape of Bones

a. Bone is living tissue, containing blood vessels and nerves within the hard bone structures. The living cells that form bones are osteocytes. Bone cells have the ability to select calcium and other minerals from blood and tissue fluid and to deposit the calcium in the connective tissue fibers between cells. With increasing age, from childhood to adulthood, bones become harder; in old age, bones become brittle because there are higher proportions of minerals and fewer active cells. Periosteum, the membrane covering bone surfaces, carries blood vessels and nerves to the bone cells. Bone-producing cells in periosteum are active during growth and repair of injuries. Two kinds of bone are formed by the bone cells—compact and cancellous. Compact bone is hard and dense, while cancellous bone has a porous structure. The combination of compact and cancellous bone cells produces maximum strength with minimum weight.

b. Bones are classified by their shape as long, short, flat, and irregular. Long bones are in the extremities and act as levers to produce motion when acted on by muscles. Short bones, strong and compact, are in the wrist and ankle. Flat bones form protective plates and provide broad surfaces for muscle attachments; *for example,* the shoulder blades. Irregular bones have many surfaces and fit into many locations; *for example,* the facial bones, vertebral, and pelvic bones. A long bone is used as an example of bone structure (fig. 2-7).

(1) Long bones have a shaft (the diaphysis) and two extremities (the epiphyses). The shaft is a heavy cylinder of compact bone with a central medullary (marrow) cavity. This cavity contains bone marrow, blood vessels, and nerves. Cancellous bone is located toward the epiphyses and is covered by a protecting layer of compact bone.

(2) Articular cartilage covers the joint surfaces at the ends of a long bone. The cartilage provides a smooth contact surface in joint formation and gives some resilience for shock absorption.

(3) Periosteum, the membrane covering the bone surface, is anchored to the bone by connective tissue fibers. It is essential for bone nourishment and repair. In severe bone injuries, the periosteum may be torn away or damaged, inhibiting repair of the bone.

2-12. Bone Marrow

Two kinds of marrow, yellow and red, are found in the marrow cavities of bones. Red bone marrow is active blood cell manufacturing material, producing red blood cells and many of the white blood cells. Deposits of red bone marrow in an adult are in cancellous portions of some bones—the skull, ribs, and sternum, for example. Yellow bone marrow is mostly fat and is found in marrow cavities of mature long bones. The examination of red marrow deposits is important for diagnostic tests when the condition of developing blood cells must be determined. For microscopic examination, the doctor obtains a small amount through a special needle puncture, usually in the sternum.

2-13. Bone Landmarks

The special markings and projections on bones are used as points of reference. Each marking has a function; *for example,* in joint formation, for muscle attachments, or as passageways for blood vessels and nerves. Terms used to refer to bone markings include—

a. Foramen—an opening, a hole.

b. Sinus—an air space.

c. Head—a rounded ball end.

d. Neck—a constricted portion.

e. Condyle—a projection fitting into a joint.

f. Fossa—a socket.

g. Crest—a ridge.

h. Spine—a sharp projection.

2-14. The Skull

The skull forms the framework of the head. It has 29 bones—8 cranial, 14 facial, 6 ossicles (3 tiny bones in each ear), and 1 hyoid (a single bone between the skull and neck area).

a. Cranial Bones. The cranial bones support and protect the brain. They fuse together after birth in firmly united joints called sutures. The eight

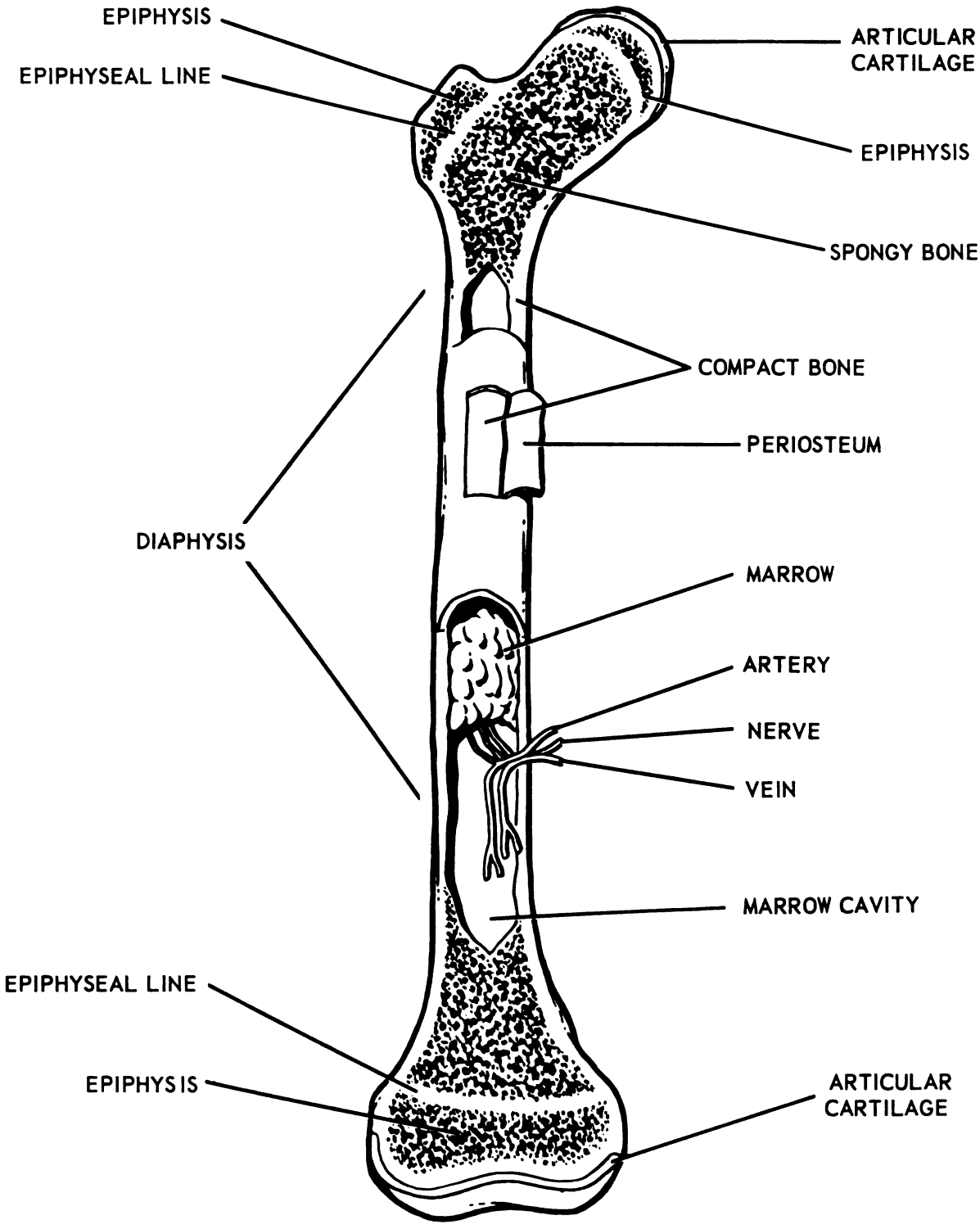


Figure 2-7. A long bone (femur).

cranial bones include one frontal, two parietal, one occipital, two temporal, one ethmoid, and one sphenoid (fig. 2-8 Ⓐ). The frontal bone forms the forehead, part of the eye socket, and part of the nose. The parietal bones form the dome of the skull and the upper side walls. The occipital bone forms the back and base of the skull. (The foramen magnum, the large hole in the lower part of the occipital bone, is the passageway for the spinal cord.) The temporal bones form the lower part of each side of the skull and contain the essential organs of hearing and of balance in the middle and

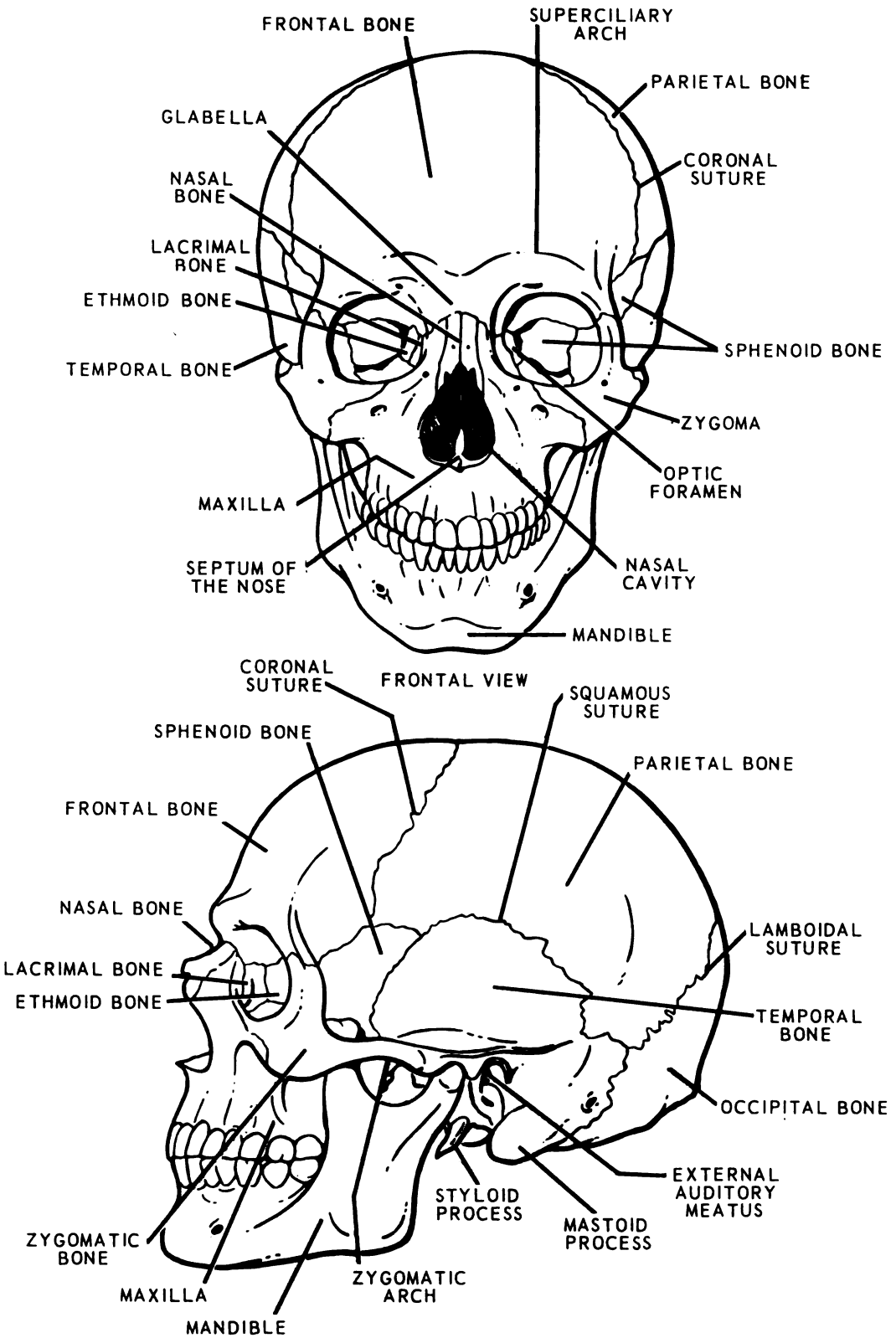


Figure 2-8. The skull.

inner parts of the ear. The ethmoid and sphenoid bones complete the floor of the cranium, the ethmoid toward the front and the sphenoid toward the center. The air spaces in the frontal, ethmoid, and sphenoid bones are sinuses.

b. Facial Bones. The 14 facial bones fit together like a very complicated jigsaw puzzle; for example, part of 7 different cranial and facial bones form each eye socket; 2 maxillary bones, the upper jaw; 2 zygomatic, the upper cheeks; and 1 mandible, the lower jaw (fig. 2–8 Ⓑ). The maxillary bones support the upper teeth, and the mandible supports the lower teeth. The joints formed by the mandible and temporal bones permit jaw movement. Nine smaller facial bones complete the nose and roof of the mouth (two nasal, two turbinate, one vomer, two lacrimal, and two maxilla).

2–15. The Vertebral Column

(fig. 2–9)

The 26 bones of the vertebral column form a flexible structure, supporting the head, thorax, and the upper extremities. The arrangement of the vertebrae provides a protected passageway for the spinal cord. Vertebral bones are classified into four regions—cervical (neck); thoracic (chest); lumbar (lower back); and sacral-coccygeal (pelvic).

a. Vertebral Structure.

(1) A typical vertebra has an anterior portion, the body, and a posterior portion, the arch (fig. 2–10). The body and the arch encircle the spinal canal, the opening through which the spinal cord passes. Between vertebral bodies are the intervertebral discs, which are fibrocartilage structures that serve as shock-absorbing connections between vertebrae. The irregular projections from the arches are spinous processes posteriorly (these are the projections you feel when you run your fingers along the midline of the back) and transverse processes laterally. Intervertebral foramena are openings on either side of the arches for passage of spinal nerves to and from the spinal cord.

(2) The movement of casualties suspected of having a spinal injury is always potentially hazardous. Careless movement increases the possibility of damage to the spinal cord. At least three persons are needed to move such a casualty. It is particularly important that the individual directing the movement understand the anatomy and physiology of the vertebral column and its relationship with the spinal cord and nerves.

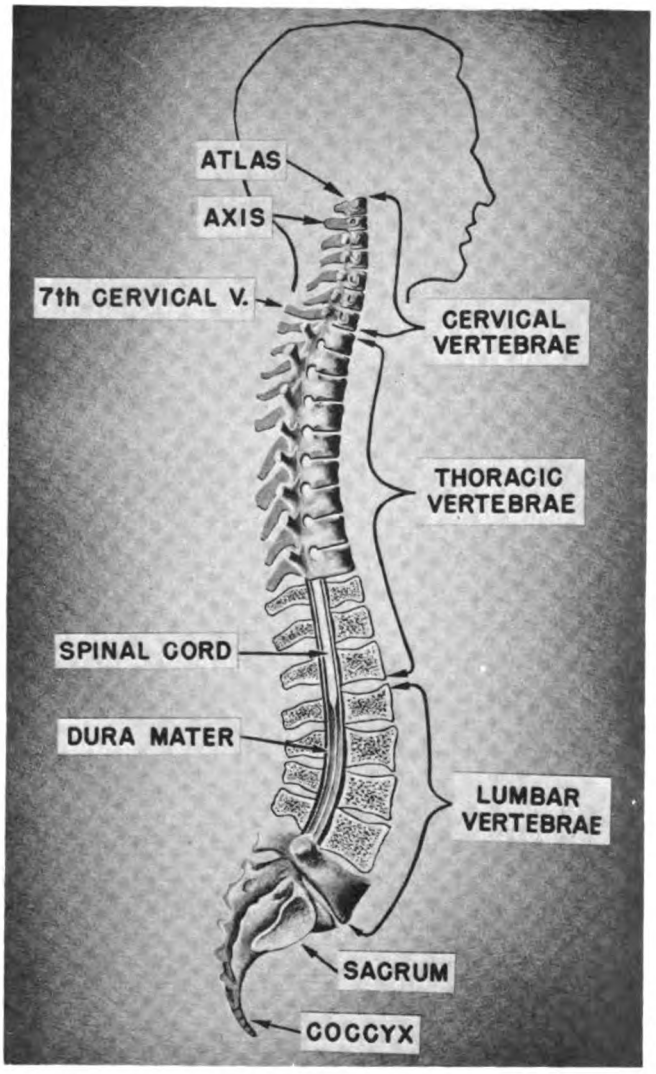


Figure 2–9. Vertebral column.

b. Vertebral Curves. The vertebral column has four normal curves for strength and balance —cervical and lumbar curves are concave, curving inward; thoracic and sacral curves are convex, curving outward. Abnormal, exaggerated spinal curvatures can be disabling.

c. Classification of Vertebrae. Seven cervical vertebrae are in the neck region. The first cervical vertebra is called the atlas, the second vertebra, the axis. These are the only named vertebrae. All other vertebrae are numbered according to region. The prominent knob at the base of the neck is formed by the spinous process of the 7th cervical vertebra. Twelve thoracic vertebrae form the posterior wall of the chest, and each thoracic vertebra articulates with one pair of ribs. The five lumbar vertebrae are in the lower back and support the posterior abdominal wall. The sacrum, a

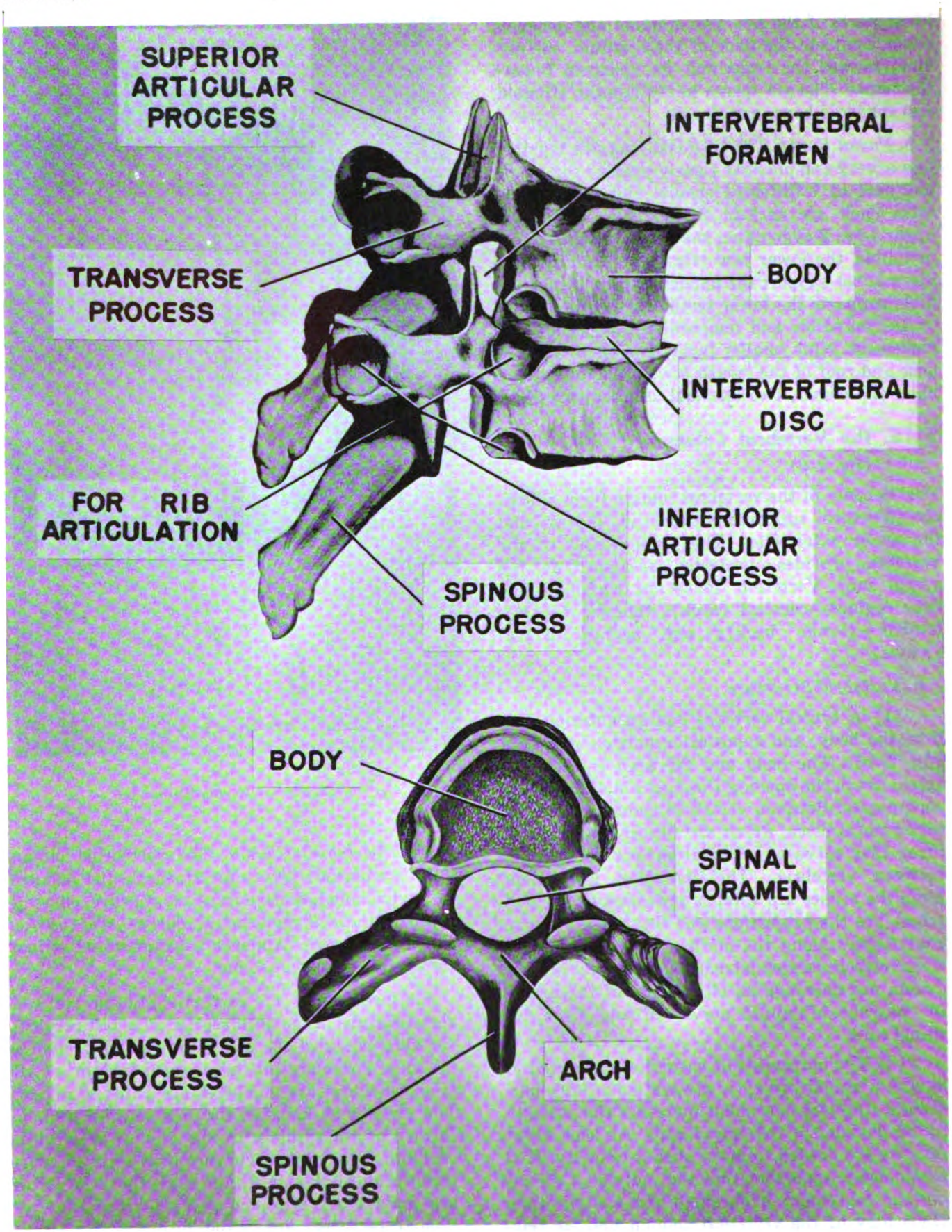


Figure 2–10. Typical vertebrae.

flat, spade-shaped bone, forms the posterior part of the pelvic girdle. The coccyx is the "tail bone," the thin, curving end of the vertebral column. In the adult, five sacral bones have fused to form one sacrum, and four coccygeal bones have fused to form one coccyx.

2-16. The Thorax

The thorax, or chest cage, is formed by 25 bones: 12 thoracic vertebrae, 2 pairs of ribs, and 1 sternum. Rib cartilages (costal cartilages) complete the chest cage. The thorax contains and protects the heart, lungs, and related structures of circulation and respiration. The ribs curve outward, forward, and downward from their posterior attachments to the vertebrae. The first seven pairs of ribs are joined directly to the sternum by their costal cartilages. The next three pairs (numbered 8, 9, 10), are attached to the sternum indirectly—each cartilage attaches to the one above —while the last two pairs, "the floating ribs," are not attached to the sternum. The sternum is the anterior flat breastbone and the ribs form the expandable chest cage wall.

2-17. The Shoulder Girdle and Upper Limbs

(fig. 2-11)

The shoulder girdle is a flexible yoke that suspends and supports the arms. Held in place by muscles, it has only one point of attachment to the axial skeleton—the joint between the clavicle and sternum. The shoulder girdle is formed by two scapulae posteriorly and two clavicles anteriorly. The bones of the shoulder and upper limb include the scapula (shoulder blade); clavicle (collar bone); humerus (arm bone); radius and ulna (forearm bones); carpals (wristbones); metacarpals (hand bones); and phalanges (finger bones).

a. The scapula is a large triangular bone extending from the second to the seventh or eighth ribs, posteriorly. The heavy ridge extending across the upper surface of the scapula ends in a process called the acromion, which forms the tip of the shoulder and the joint with the clavicle, anteriorly. A socket for the head of the humerus is on the lateral surface of the scapula. Strong muscles attach to the scapula for shoulder and arm movement.

b. The clavicle is a slender, S-curved bone lying horizontally above the first rib. The lateral end of the clavicle forms a joint with the scapula (acromio-clavicular joint). The medial end of the clavicle forms a joint with the sternum at the sterno-clavicular joint, which can be felt as the knob on either side of the notch at the base of the throat. The clavicle acts as a shoulder brace, holding the shoulder up and back. When the clavicle is fractured, the shoulder slumps forward.

c. The humerus is a heavy long bone in the arm that extends from the shoulder to the elbow. The rounded proximal end fits into the scapula in a socket, the glenoid fossa. The distal end of the humerus forms the elbow joint, articulating with the ulna and part of the radius. Strong muscles reinforce the shoulder joint and attach to the humerus, protecting the large blood vessels and nerves that extend along the bone.

d. The radius and ulna (fig. 2-12) are the bones of the forearm. The ulna, on the little finger side, forms the major part of the elbow joint with the humerus. A projection of the ulna, the olecranon, is the "funny bone" at the point of the elbow. The radius, on the thumb side, forms the major part of the wrist joint. The action of the radius about the ulna permits hand turning.

e. The wrist (fig. 2-12) has eight small bones (carpal bones) arranged in two rows of four each. They articulate with each other and with the bones of the hand and forearm. Articulating with the carpals are five metacarpals which form the bony structure of the palm of the hand. The metacarpal of the thumb is particularly important—its muscular attachment permits the thumb to meet the other fingers of the hand, an action called opposing. (This opposing thumb enables the human hand to manipulate articles with great dexterity.) The 14 phalanges in each hand are the finger bones, 3 in each finger and 2 in each thumb. The nerves, blood vessels, and tendons in the hand and wrist are close to the surface and, when injured, can cause serious disability. Injuries to the hand require special evaluation and painstaking treatment to prevent deformities and crippling of finger movements.

2-18. The Pelvis and Lower Limbs

The two hip bones form the pelvic girdle, which provides articulation for the lower limbs. The pelvis, jointed by the hip bones, sacrum, and coccyx, forms a strong bony basin which supports the trunk and protects the contents of the abdomino pelvic cavity. When the upright body is in proper alinement, the pelvis distributes the weight evenly to both lower extremities. The bones of the pelvis

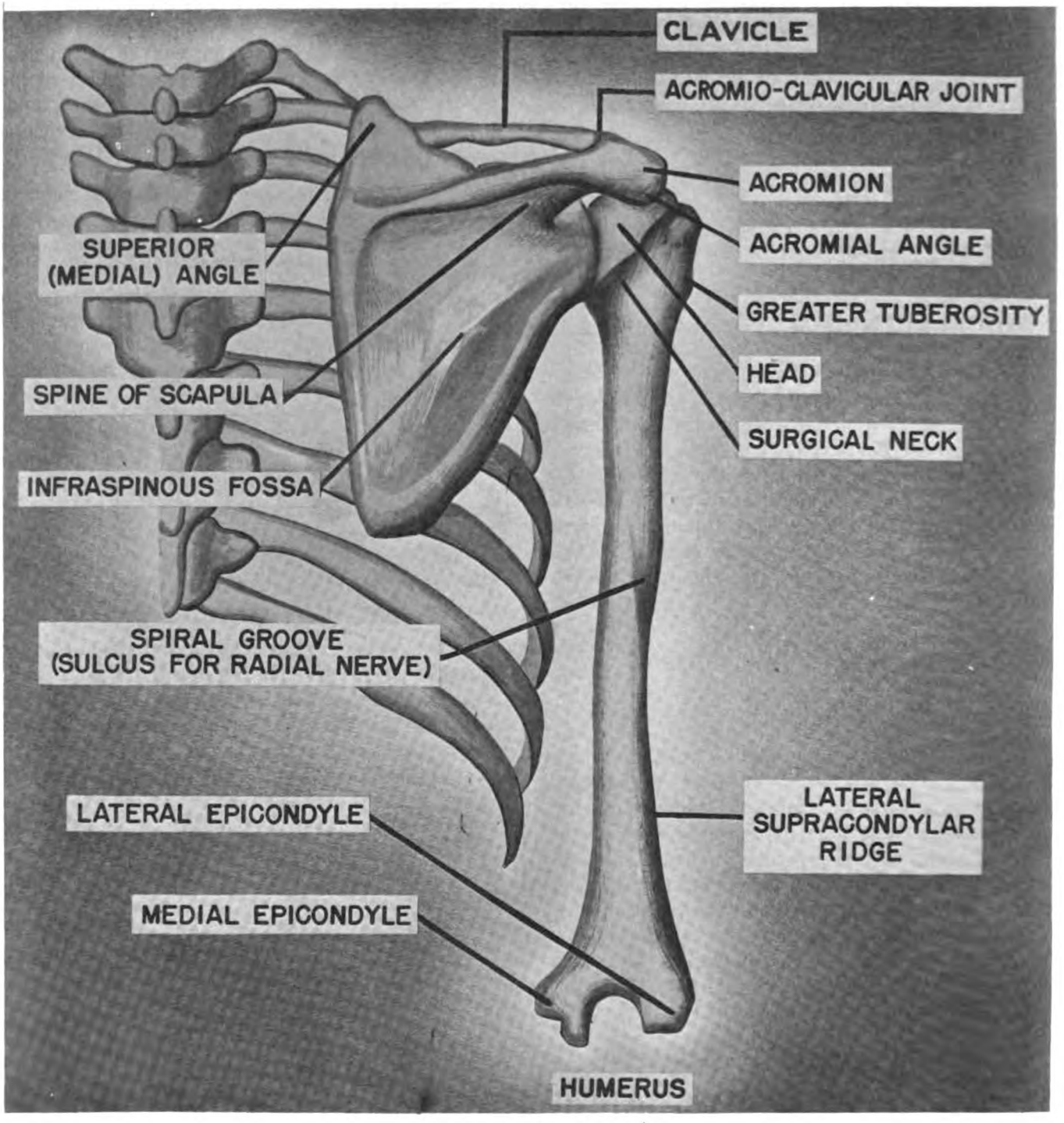


Figure 2–11. Shoulder girdle.

and lower extremity are the os coxa (hip bone), femur (thigh bone), patella (knee cap), tibia and fibula (leg bones), tarsals (ankle bones), metatarsals (foot bones), and phalanges (toe bones) (fig. 2–6). In contrast to the shoulder girdle, the pelvic girdle is inflexible and very strong (for weight bearing).

a. The hip bone is formed by the fusion of three bones into one massive, irregular bone, the os coxa. The two hip bones are joined together anteriorly in the symphysis pubis. Posteriorly, the hip bones are fused to the sacrum. Each hip bone has three distinctive parts—the ilium, ischium and pubis (fig. 2–13). The ilium is the broad, flaring

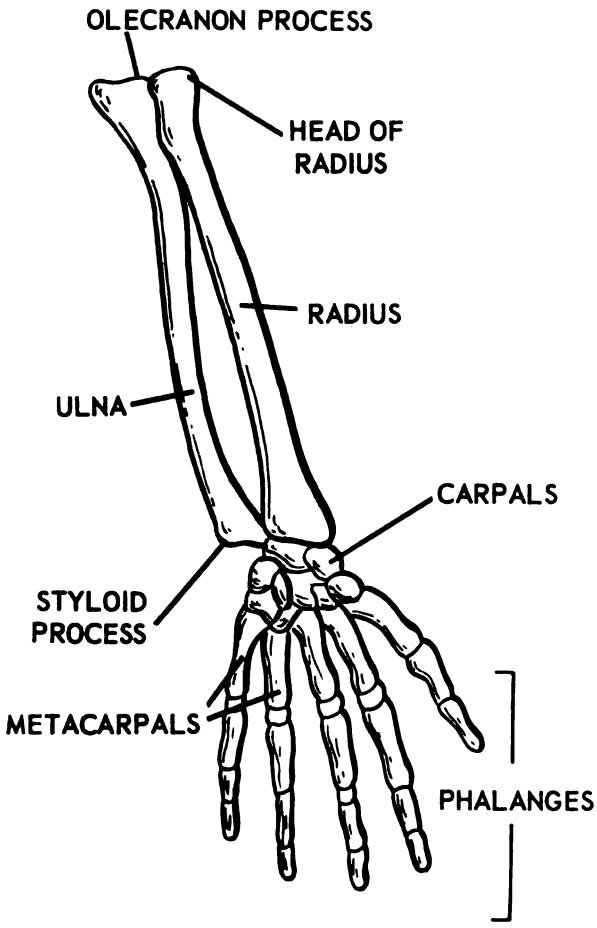


Figure 2-12. Forearm and hand.

upper part of the hip. The iliac crests, the upper ridges of the ilium, are important landmarks. The ischium is the lower, posterior portion on which one sits. The pubis is the anterior portion of the hip. A deep, cup-shaped socket, the acetabulum, is located on the lower lateral surface of each hip bone. The cup shape of the acetabulum fits the head of the femur to form the hip joint.

b. The femur or thigh bone (fig. 2-7) is the longest, strongest bone in the body. The head of the femur fits into the acetabulum of the hip bone. The neck of the femur, just below the head, is the part most frequently fractured, particularly by elderly individuals. The distal end of the femur articulates with the tibia, to form the knee joint. A large prominent projection at the junction of the shaft and neck of the femus is the trochanter, which is an important attachment for strong thigh muscles.

c. The patella, or knee cap, is the bone protecting the front of the knee joint. It is a special kind of bone embedded within the powerful tendon that extends from the strong anterior thigh muscles. The patella has an oval shape in cross section and is classified as a sesamoid bone (bone embedded in tendons).

d. The tibia and fibula are the two bones in the leg. The tibia, which is thicker and stronger, is the shin bone. It supports body weight and articulates with the femur in the knee joint. The projection at its lower end is the medial malleolus, the inner ankle bone. The fibula, the lateral leg bone, is joined to the tibia at its proximal end, but not to the femur. The projection at the distal end of the fibula is the lateral malleolus, the outer ankle bone.

e. The skeleton of the foot consists of the tarsals, metatarsals, and the phalanges. Seven tarsals form the ankle, heel, and posterior half of the instep. The talus is the largest ankle bone, and the calcaneus is the heel bone. Five metatarsals form the anterior half of the instep. The tarsals and metatarsals together form the arch of the foot, a structure important in weight distribution to the foot. Tendons and ligaments hold the tarsals and metatarsals in their arched position, and when this support is weak, the foot is flat. The 14 phalanges of the toes are similar to finger bones but are less important for foot function than fingers are for hand function.

2-19. Joints (Articulations)

A joint is a structure which holds together separate bones. Joints are classified according to the amount of movement they permit—immovable, slightly movable, and freely movable (fig. 2-14).

a. Immovable joints have bone surfaces fused together to prevent motion. At one time during skeletal development, these joints had some movement but as the bones matured they grew together for stability. The pelvic girdle, sacral and coccygeal vertebrae, and skull bones are examples of immovable joints.

b. Slightly movable joints have cartilage discs between bones and are held in place by strong ligaments. The cartilage permits some give, and ligaments prevent bone separation. Vertebral bodies and the symphysis pubis are examples of slightly movable joints.

c. Freely movable joints permit maximum motion. These joints have a more complex arrangement since they have joint cavities. The several parts of a joint cavity include the joint capsule, the capsule lining (synovial membrane), and some lubricating fluid within the cavity. Ligaments are

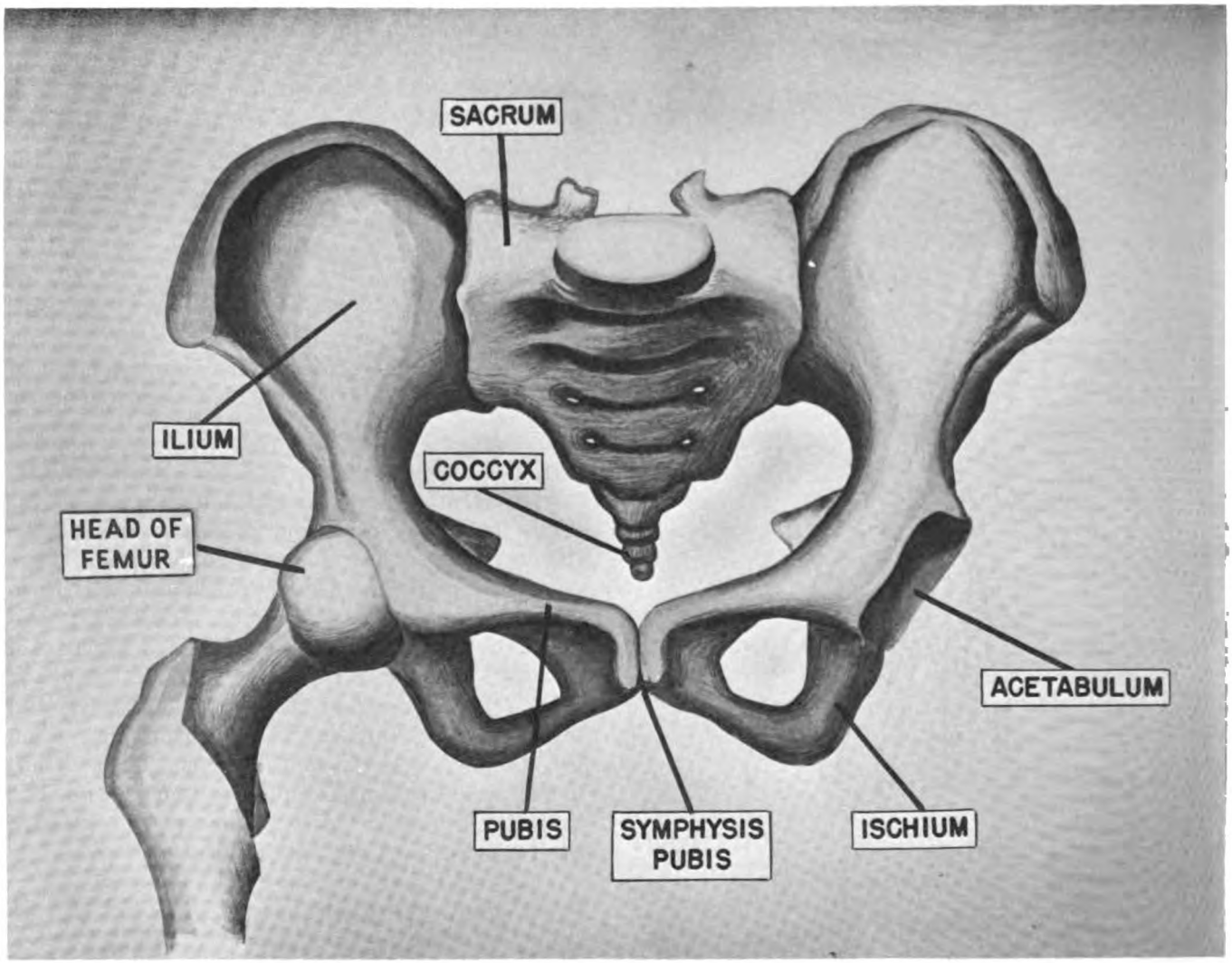


Figure 2-13. Pelvis.

strong fibrous connective tissue bands that hold the bones together at the joint. In some joints, the ligaments enclose the joint, forming the joint capsule.

d. Some joint disorders are mechanical—the parts of the joint are displaced or dislocated. Another term for a type of dislocation is "subluxation," a partial displacement of one bone surface within the joint. When the ligaments holding the joint together are partially torn, but the joint is not displaced, the injury is called a sprain.

2-20. Joint Movements

a. Movable joints allow change of position and motion. Examples of joint movement (app. B) are flexion (bending), extension (straightening), abduction (movement away from the midline), and adduction (movement toward the midline), pronation (turning the forearm so that the palm of the hand is down), and supination (turning the forearm so that the palm of the hand is up).

b. Attempts to force joints to move beyond their normal limitations can be disastrous. The structure of the joint determines the kind of movement that is possible, since the bone ends reciprocate, or fit into each other, at the joint. Examples of joint structure that permit certain kinds of joint movement include:

(1) Ball and socket joints, as in the shoulder and hip. These joints permit the widest range of motion—flexion, extension, abduction, adduction, and rotation.

(2) Hinge joints, as in the elbow and knee. Hinge joints permit flexion and extension. Elbow joints have forward movement—the anterior bone surfaces approach each other. Knee joints have

backward movement—the posterior bone surfaces approach each other.

(3) Pivot joints, as at the head and neck, at the first and second cervical vertebrae. The distal ends of the radius and ulna also form a pivot joint for rotation of the wrist.

2–21. Joints and Bursae

At some joint locations, the tendon connecting muscle to bone passes over a joint; *for example,* at the shoulder, elbow, knee, and heel. To reduce pressure, small sacs containing fluid are formed over and around the tendon. The sac is a bursa, and an irritated bursa is bursitis. The knee has four bursae, over and around the patella. When domestic chores included scrubbing floors on hands and knees, inflammation of the knee bursae was called "housemaid's knee." Bursitis can be very painful, and normal movement may be impossible.

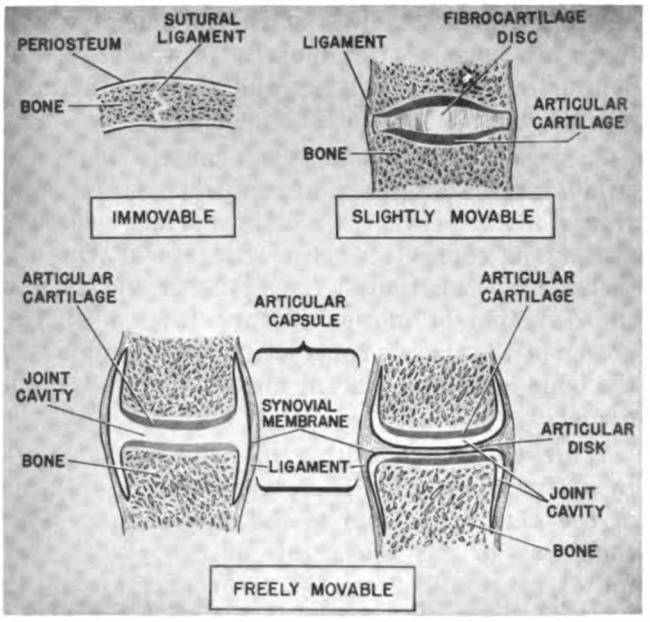


Figure 2–14. Types of joints.

Section IV. THE SKELETAL MUSCULAR SYSTEM

2–22. Muscles

The muscles of the body include the smooth muscle in the walls of internal organs, the cardiac muscle in the walls of the heart, and the skeletal muscle attached to and causing movements of bones. Muscles have the ability to contract, and it is this power of muscle contraction that produces body movements. The skeletal muscles and their action and movements on bones and joints will be discussed in this section.

2–23. Skeletal Muscles

Although skeletal muscles are called voluntary muscles, they require a functioning nerve supply and something to pull against for normal contraction. It is important to think of skeletal muscles as one part of a three-part, neuro-muscular-skeletal unit. *For example,* a functioning nerve supply (a motor nerve from the central nervous system) is needed to stimulate muscle contraction; the muscle itself must be able to contract and to relax; and the power of the muscle contraction must be transmitted to a bone, or other attachment, to produce the desired movement. When any one part of this three-part unit cannot function normally, the other two parts also lose their ability to function normally. When all three parts—nerve, muscle, and bone—are intact, the many movements associated with skeletal muscles are possible. Skeletal muscle movements include locomotion, or moving from place to place; rhythmic breathing movements; blinking of eyelids; position changes; chewing and swallowing; coughing; and changes in facial expression. Many of these movements are essential for survival.

2–24. Muscle Structure and Muscle Movements

Long, slender muscle cells form fibers; muscle fibers are grouped together into bundles; and muscle bundles are grouped together to form an individual skeletal muscle. Each skeletal muscle is wrapped in a connective tissue sheath, a form of fascia. This muscle sheath incloses the blood vessels and nerves that stimulate and nourish the muscle cells. The connective tissue parts are opaque, or whitish, in color, while the muscle bundles are the lean, red-meat part of muscles. Individual muscles differ considerably in size, shape, and arrangement of muscle fibers. The fiber arrangement determines the line of pull of an individual muscle.

a. Muscle Attachments. Extensions of muscle sheath become continuous with tough connective tissue attachments such as tendons or aponeuroses that bind muscles to bones or to adjacent muscles. Tendons are cordlike attachments of connective tissue that unite with the periosteum of bone. Aponeuroses are broad, sheetlike attachments which can unite with muscle sheaths of adjacent

muscles. At the midline of the abdomen, where there are no bones for muscles to attach to, abdominal muscles to the left and right of the midline are attached to central aponeuroses.

b. Muscle Movements. When muscle fibers are stimulated to contract by an impulse received from a motor nerve, the muscle shortens and pulls against its connective tissue attachment. One attachment is sometimes a fixed joint or anchor, and the direction of motion is then toward it. The power of the muscle contraction is transmitted to the bone or to an adjacent muscle, and movement occurs.

c. Muscle Tone. Healthy muscle is characterized by active contraction in response to the reaction of the nervous system to the environment. This readiness to act (resulting in firing of motor units) as stimuli from the environment impinge upon the nervous system is called muscle tone. Muscles that have lost their tone through lack of exercise, through primary muscle disease, or through nerve damage become flabby (flaccid). The tone of muscles is due to the constant, steady contraction and relaxation of different muscle fibers in individual muscles, which helps to maintain the "chemical engine" of the muscle cells. Even minor exercise movements help maintain tone by renewing blood supply to muscle cells. Wriggling the toes, flexing and extending the fingers, changing the depth of respirations, turning and repositioning the body are examples of exercises that help restore and maintain muscle tone.

d. Muscle Activity. Muscle contraction consumes food and oxygen and produces acids and heat. Muscle activity is the major source of the body's heat. Acids accumulating as a result of continued activity cause fatigue, which occurs most rapidly when contractions are frequent. It occurs slowly if rest periods are taken between contractions. Exercise causes muscles to become larger, stronger, and better developed. An increase in muscle size is hypertrophy; wasting away of muscles due to inactivity is atrophy. Physical exercise is necessary to keep muscles in good condition.

2-25. Principles of Skeletal Muscle Action

A few general principles about skeletal muscle action should be understood. The three principles listed will help associate muscle actions with normal body movements and patient care activities.

a. Muscles produce movements by pulling on bones. Since bones move at joints, most muscles attach to bones above and below a joint. One bone is stabilized while the other bone moves.

b. Muscles moving a part usually lie proximal to the part moved. *For example,* muscles moving the humerus are in the shoulder, chest, and back; muscles moving the femur are in the lumbar and pelvic region.

c. Muscles almost always act in groups rather than singly. The coordinated action of several muscles produces movement—while one group contracts, the other group relaxes, and vice versa. The muscle whose contraction produces the movement is the prime mover. The muscle which relaxes is the antagonist. In bending (flexing) and stretching (extending) the forearm, the biceps and triceps in the upper arm are, alternately, prime movers and antagonists.

2-26. Principal Groups of Skeletal Muscles

Since there are more than 400 individually named skeletal muscles, only a few will be discussed in this manual. In figure 2-15, both Ⓐ and Ⓑ illustrate the general location of the muscles discussed. Muscles are usually named for one or more features such as their location, action, shape, or points of attachment.

a. Head and Face. Muscles of the head and face act in movements of the eye, facial expressions, talking, chewing, and swallowing. The orbicularis oculi closes the eyelid; the orbicularis oris closes the lips; the masseter closes the jaw and clamps the back teeth together.

b. Neck. The muscles of the neck move the head from side to side, forward and backward, and rotate it. Some also assist in respiration, speaking, and swallowing. The sternocleidomastoid bends the head forward and helps turn it to either side.

c. Chest. The strong chest muscles move the arm, brace the shoulder, and compress the chest for effective coughing. The diaphragm, the major muscle of respiration, separates the thoracic and abdominal cavities. (It is not shown in the diagram of superficial skeletal muscles.) The pectoralis major draws the upper arm forward across the chest. The latimus dorsi and trapezius are major muscles of the posterior thorax.

d. Arm. Among the muscles which cause movement of the arms are the deltoid, biceps, and triceps. (The extensors and flexors cause hand and finger movements.)

(1) The deltoid is a triangular-shaped muscle, capping the shoulder and upper arm. The deltoid lifts the arm forward, sideways, and to the rear.

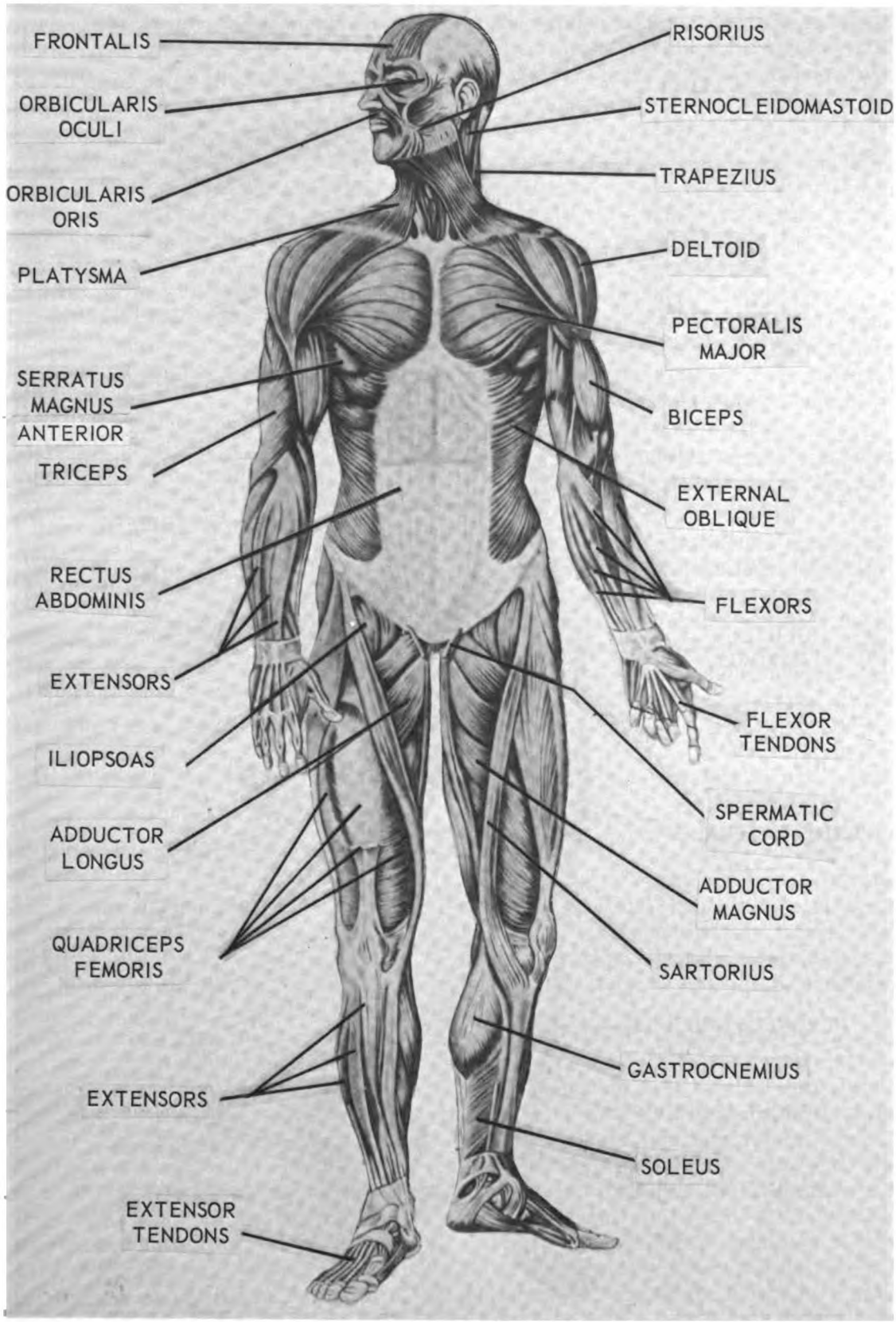


Figure 2–15. Superficial muscles.

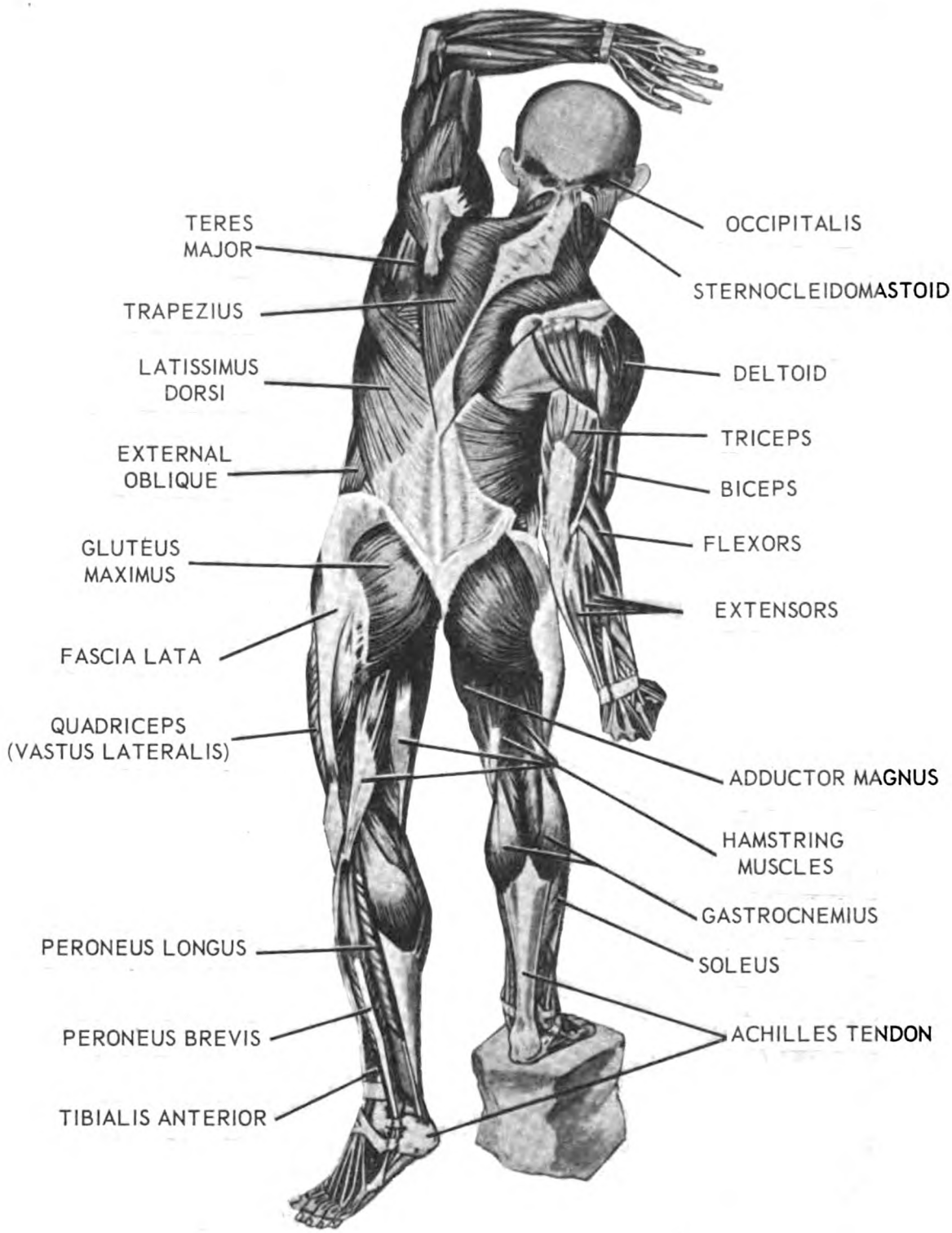


Figure 2-15—Continued.

(2) The biceps, a long, two-headed muscle located on the anterior arm, flexes the forearm at the elbow. It also helps to turn the arm palm up in supination.

(3) The triceps, a large three-headed muscle located on the posterior arm, extends the forearm at the elbow.

e. Back. The muscles of the back are large, and some are broad. Attached to vertebrae, the back muscles keep the trunk in an erect posture and aid it in bending and rotating. In the thoracic region, these muscles assist in respiration and in movements of the neck, arm, and trunk. Although the muscles of the midback are very powerful, the thigh and buttock muscles should be used in lifting to avoid straining the bony and ligamentous structures of the back.

f. Abdominal. The abdominal muscles form broad, thin layers which support the internal abdominal organs, assist in respiration, and help in flexion and rotation of the spine. Their names indicate their line of pull—external oblique, rectus abdominis (straight up and down), and transverse. Abdominal muscles also assist in urination and in defecation.

g. Perineal. The muscles of the perineum form the floor of the pelvic cavity and aid in defecation and in urination.

h. Buttocks. The thick, strong muscles of the buttocks help to stabilize the hip, and with the muscles of the posterior thigh, distribute weight to the pelvis in lifting and relieve the strain on the back muscles. This gluteus group includes the gluteus maximus, gluteus medius, and gluteus minimus. These muscles extend and rotate the thigh.

i. Thigh. The muscles located on the anterior and posterior of the thigh cross two joints, the hip and the knee. When they contract, they extend one joint and flex the other. The anterior thigh muscles include the quadriceps femoris and the posterior ones include the biceps femoris.

(1) *Quadriceps femoris.* This four-headed group of muscles located on the anterior of the thigh extends the leg at the knee. Its four muscles are the vastus lateralis, rectus femoris, vastus intermedius, and vastus medialis.

(2) *Biceps femoris (hamstring group).* This muscle group on the posterior of the thigh flexes the knee and extends the thigh.

j. Leg. The anterior muscle group of the leg includes the anterior tibialis, which flexes the foot on the leg, turning the foot upward in dorsiflexion. The largest posterior muscle of the leg is the gastrocnemius, the calf muscle, which attaches to the heel through the Achilles tendon. Contraction of the gastrocnemius causes the foot to turn downward in plantar flexion, or foot drop.

Section V. THE SKIN

2-27. Integumentary System and Its Functions

The skin is called the integumentary or covering body system and serves the body in many important ways. The most obvious feature of skin is its outward appearance; indeed, the appearance and feel of the skin are important indications of general health and hygiene. Four functions of skin are protection, as a mechanical barrier to the entrance of bacteria; regulation of body temperature, through control of heat loss; sensory perception, through nerve endings that transmit sensations of touch, heat, cold, and pain; and excretion of body wastes, through sweat. Although this is not one of its normal functions, the skin can absorb water and other substances. This property of the skin is used to advantage in prescribing local application of certain drugs. It can be harmful, too, as when toxic agents such as "G" gas, lead salts in gasoline, and insecticides are absorbed and permitted to enter the body through the skin.

2-28. Structure

The skin has two principal layers, the epidermis, or outer layer, and the dermis, the inner layer or true skin. The epidermis and dermis (fig. 2-16) are supported by a subcutaneous (under-the-skin) layer which connects the skin to underlying muscles.

a. There are no blood vessels or nerve endings in the epidermis, which has two layers, outer and inner. The outer layer has flat, scaly, lifeless cells that are constantly being worn off by surface contacts. As this is happening, rapidly growing inner epidermis cells push up and replace the top layers. Skin pigment, found in the deepest parts of these inner epidermis cells, varies in individuals. It determines the darkness or lightness of skin color. However, the color of the skin is also due to the quantity and state of the blood circulating in the dermis, the inner skin layer. Pinkness, blueness (cyanosis), or pallor (paleness) of the skin surface is due to circulating blood.

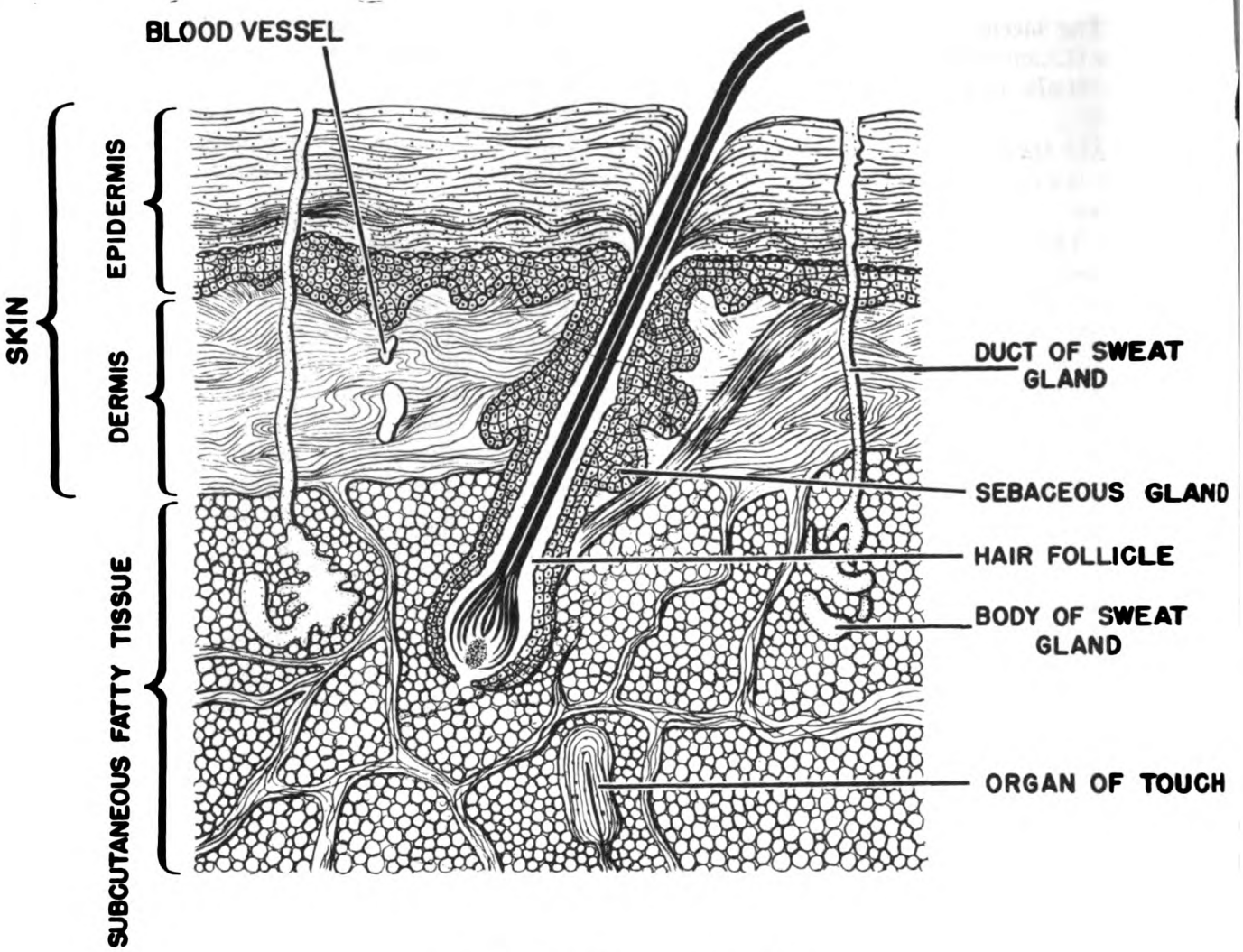


Figure 2–16. Structure of the skin.

b. The dermis is the deep, true skin layer. Nerves, blood vessels, glands, hair roots, and nail roots are in the dermis, supported by a connective tissue meshwork of elastic fibers. Tiny involuntary muscle fibers in the dermis contract and account for the reactions described as "hair standing on end" and "goose pimples."

c. The subcutaneous layer of tissue beneath the dermis is not skin. It is superficial fascia, a connective tissue. Fat and other connective tissues in the subcutaneous layer round out body surfaces and cushion bony parts. When a hypodermic injection is given, it is given into the subcutaneous tissue, below the skin layers.

2–29. Skin Accessory Organs

Hair, nails, sebaceous (oil) glands, and sweat glands are skin accessory organs. Each hair grows from a root embedded in the dermis, or below the dermis. A little tube, the hair follicle, incloses the root. Fingernails and toenails grow from nail beds buried at the proximal ends of the nails. The sebaceous glands secrete an oil called sebum, which lubricates the hair and the skin surface. This oily secretion keeps the skin pliable and helps keep it waterproof. When the openings of the sebaceous glands become plugged with dirt, they form blackheads. Sweat glands manufacture sweat, or perspiration, from fluid drawn from the blood. Sweat contains salts and organic wastes and is about 99 percent water. It is discharged through skin openings called the pores. As sweat evaporates, the body is cooled. Sweat formation and excretion is an important mechanism for losing body heat.

2–30. Skin as a Temperature Regulator

Skin helps regulate the temperature of the body

by controlling heat loss in two different ways. Blood vessels in the dermis can change size. *For example,* when blood vessels are dilated, warm blood is closer to the skin surface, and heat is lost more rapidly. When blood vessels constrict, the amount of blood at the skin surface is decreased, and heat is conserved. Because the surface of the skin is so large, heat loss by radiation is considerable. Added to this heat loss by radiation is the heat loss by evaporation of sweat. In very humid weather, evaporation of sweat from the skin and from saturated clothing decreases.

Section VI. THE CIRCULATORY SYSTEM

2–31. Introduction

The circulatory system has two major fluid transportation systems, the cardiovascular and the lymphatic.

a. Cardiovascular System. This system, which contains the heart and blood vessels, is a closed system, transporting blood to all parts of the body. Blood flowing through the circuit formed by the heart and blood vessels (fig. 2–17) brings oxygen, food, and other chemical elements to tissue cells and removes carbon dioxide and other waste products resulting from cell activity.

b. Lymphatic System. This system, which provides drainage for tissue fluid, is an auxiliary part of the circulatory system, returning an important amount of tissue fluid to the blood stream through its own system of lymphatic vessels.

2–32. The Heart

The heart, designed to be a highly efficient pump, is a four-chambered muscular organ, lying within the chest, with about ⅔ of its mass to the left of the midline (fig. 2–18). It lies in the pericardial space in the thoracic cavity between the two lungs. In size and shape, it resembles a man's closed fist. Its lower point, the apex, lies just above the left diaphragm.

a. Heart Covering. The pericardium is a double-walled sac inclosing the heart. The outer fibrous surface gives support, and the inner lining prevents friction as the heart moves within its protecting jacket. The lining surfaces of the pericardial sac produce a small amount of pericardial fluid needed for lubrication to facilitate the normal movements of the heart.

b. Heart Wall. This muscular wall is made up of cardiac muscle called myocardium.

c. Heart Chambers. There are four chambers in the heart. These chambers are essentially the same size. The upper chambers, called the atria, are seemingly smaller than the lower chambers, the ventricles. The apparent difference in total size is due to the thickness of the myocardial layer. The right atrium communicates with the right ventricle; the left atrium communicates with the left ventricle. The septum (partition), dividing the interior of the heart into right and left sides, prevents direct communication of blood flow from right to left chambers or left to right chambers. This is important, because the right side of the heart receives deoxygenated blood returning from the systemic (body) circulation. The left side of the heart receives oxygenated blood returning from the pulmonary (lung) circulation. The special structure of the heart keeps the blood flowing in its proper direction to and from the heart chambers.

d. Heart Valves. The four chambers of the heart are lined with endocardium. At each opening from the chambers this lining folds on itself and extends into the opening to form valves. These valves allow the blood to pass from a chamber but prevent its return. The atrioventricular valves, between the upper and lower chambers, are within the heart itself. The semilunar valves are within arteries arising from the right and left ventricles.

(1) *Atrioventricular valves.* The tricuspid valve is located between the right atrium and right ventricle. It has three flaps or cusps. The bicuspid valve or mitral valve is located between the left atrium and left ventricle. It has two flaps or cusps.

(2) *Semilunar valves.* The pulmonary semilunar (half-moon shaped) valve is located at the opening into the pulmonary artery that arises from the right ventricle. The aortic semilunar valve is located at the opening into the aorta that arises from the left ventricle.

2–33. Flow of Blood Through the Heart

It is helpful to follow the flow of blood through the heart in order to understand the relationship

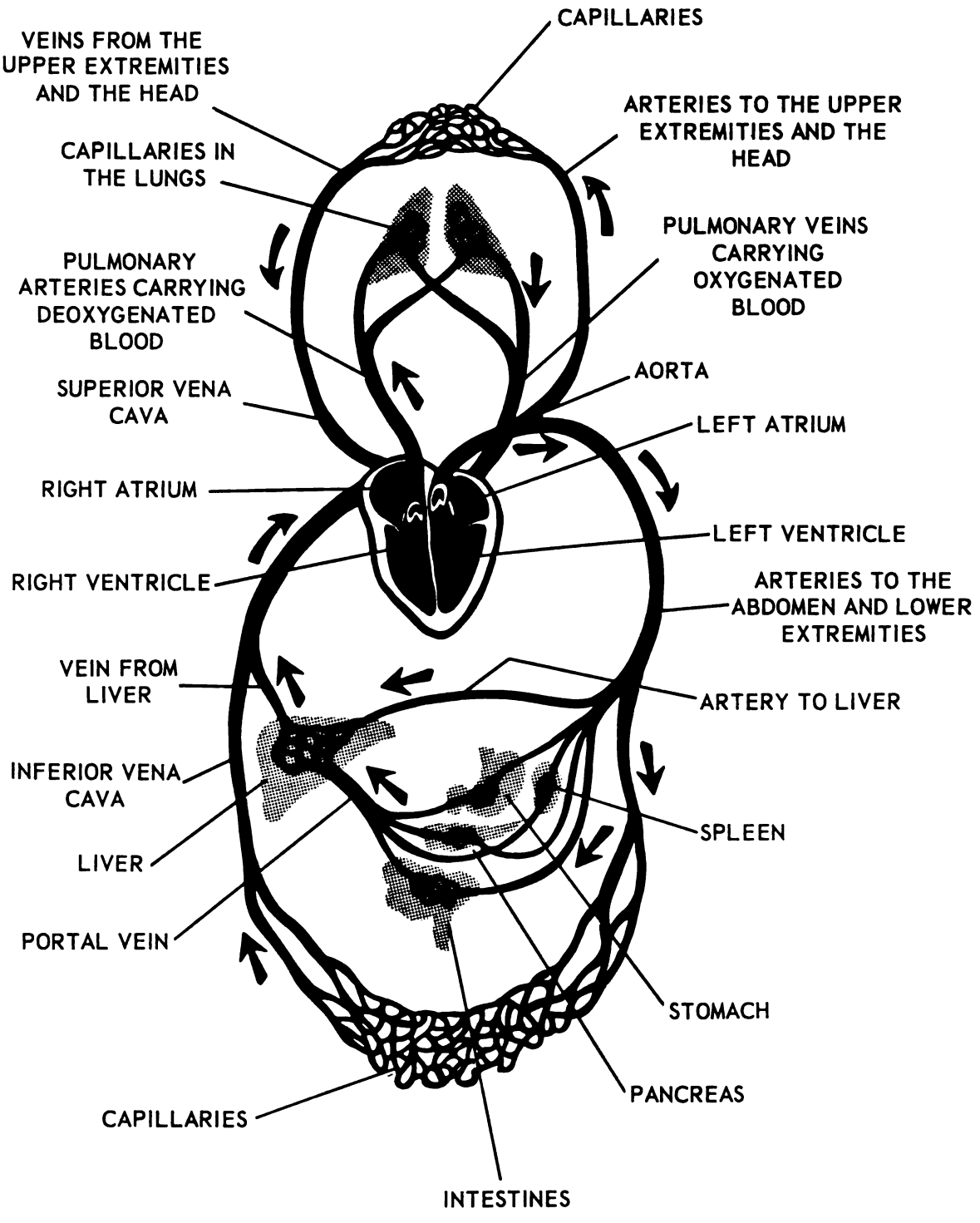


Figure 2–17. Circulation of the blood (diagrammatic).

of the heart structures. Remember, the heart is the pump and is also the connection between the systemic circulation and pulmonary circulation. All the blood returning from the systemic circulation must flow through the pulmonary circulation for exchange of carbon dioxide for oxygen. Blood from the upper part of the body enters the heart through a large vein, the superior vena cava, and from the lower part of the body by the inferior vena cava (fig. 2–19).

a. Blood from the superior vena cava and inferior vena cava enters the heart at the right

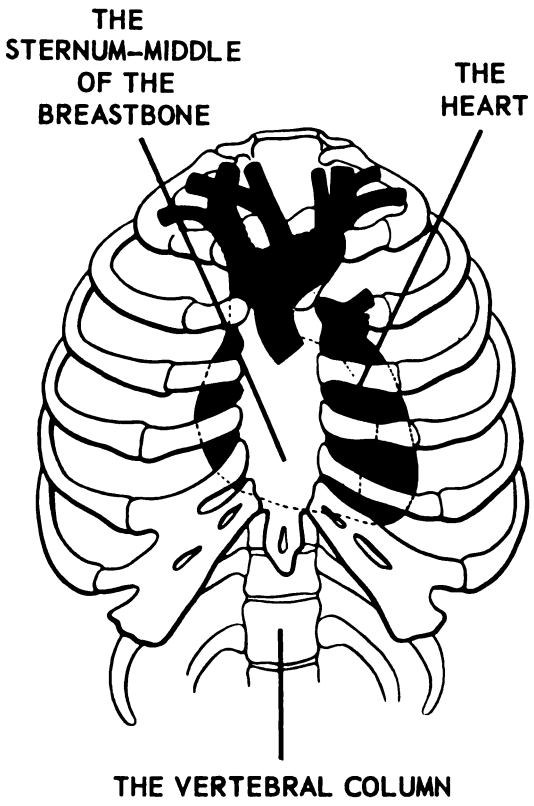


Figure 2-18. Heart and thoracic cage.

atrium. The right atrium contracts, and blood is forced through the open tricuspid valve into the relaxed right ventricle.

b. As the right ventricle contracts, the tricuspid valve is closed, preventing back flow into the atrium. The pulmonary semilunar valve opens as a result of the force and movement of the blood, and the right ventricle pumps the blood into the pulmonary artery.

c. The blood is carried through the lung tissues, exchanging its carbon dioxide for oxygen in the alveoli. This oxygenated blood is collected from the main pulmonary veins and delivered back to the left side of the heart to the left atrium.

d. As the left atrium contracts, the oxygenated blood flows through the open bicuspid (mitral) valve into the left ventricle.

e. As the left ventricle contracts, the bicuspid valve is closed. The aortic semilunar valve opens as a result of the force and movement of the blood, and the left ventricle pumps oxygenated blood through the aortic semilunar valve into the aorta, the main artery of the body. Oxygenated blood now starts its flow to all of the body cells and tissues. The systemic circulation starts from the left ventricle, the pulmonary circulation from the right ventricle.

2-34. Blood and Nerve Supply of the Heart

a. Coronary Arteries. The heart gets its blood supply from the right and left coronary arteries. These arteries branch off the aorta just above the heart, then subdivide into many smaller branches within the heart muscle. If any part of the heart muscle is deprived of its blood supply through interruption of blood flow through the coronary arteries and their branches, the muscle tissue deprived of blood cannot function and will die. This is called myocardial infarction. Blood from the heart tissue is returned by coronary veins to the right atrium.

b. Nerve Supply. The nerve supply to the heart is from two sets of nerves originating in the medulla of the brain. The nerves are part of the involuntary (autonomic) nervous system. One set, the branches from the vagus nerve, keeps the heart beating at a slow, regular rate. The other set, the cardiac accelerator nerves, speeds up the heart. Heart muscle has a special ability; it contracts automatically, but the nerve supply is needed to provide an effective contraction for blood circulation. Within the heart muscle itself, there are special groups of nerve fibers that conduct impulses for contraction. These groups make up the conduction system of the heart. When the conduction system does not operate properly, the heart muscle contractions are uncoordinated and ineffective. The impulses within the heart muscle are minute electric currents, which can be picked up and recorded by the electrocardiogram, the ECG.

2-35. The Heartbeat and Heart Sounds

a. Heartbeat. This is a complete cycle of heart action—contraction, or systole, and relaxation, or diastole. During systole, blood is forced from the chambers. During diastole, blood refills the chambers. The term cardiac cycle means the complete heart beat. The cardiac cycle, repeated continuously at a regular rhythm, occurs 70–80 times per minute. Each complete cycle takes less than one second—in this brief time, all of the heart action needed to move blood must take place, and the heart must be ready to repeat its cycle.

b. Heart Sounds. When heard through a stethoscope, heart sounds are described as "lubb-dup." The first sound, "lubb," is interpreted as the sound, or vibration, of the ventricles contracting

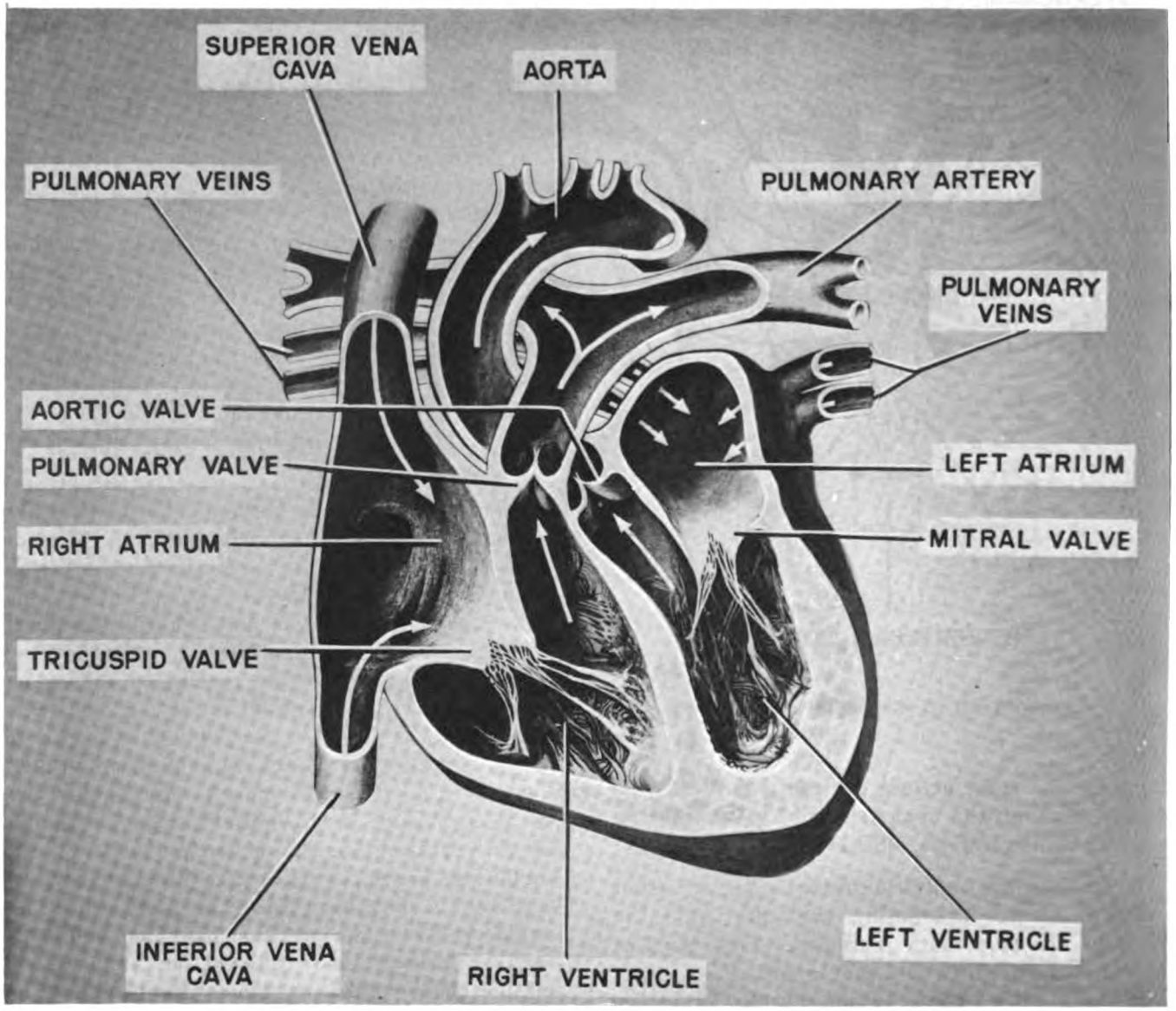


Figure 2–19. The heart, chambers, and flow of blood.

and atrioventricular valves closing. The second, higher-pitched sound, "dup," is interpreted as the sound of the semilunar valves closing. The doctor listening to the heart sounds can detect alterations of normal sounds; the interpretation of these heart sounds is part of the diagnosis of heart disease.

2–36. Blood Vessels

The blood vessels are the closed system of tubes through which the blood flows. The arteries and arterioles are distributors. The capillaries are the vessels through which all exchange of fluid, oxygen, and carbon dioxide take place between the blood and tissue cells. The venules and veins are collectors, carrying blood back to the heart. The capillaries are the smallest of these vessels but are of greatest importance functionally in the circulatory system.

a. The Arteries and Arterioles. The system of arteries (fig. 2–20) and arterioles is like a tree, with the large trunk, the aorta, giving off branches which repeatedly divide and subdivide. Arterioles are very small arteries, about the diameter of a hair. By way of comparison, the aorta is more than 1 inch in diameter.) An artery wall has a layer of elastic, muscular tissue which allows it to expand and recoil. When an artery is cut, this wall does not collapse, and bright red blood escapes from the artery in spurts. Arterial bleeding

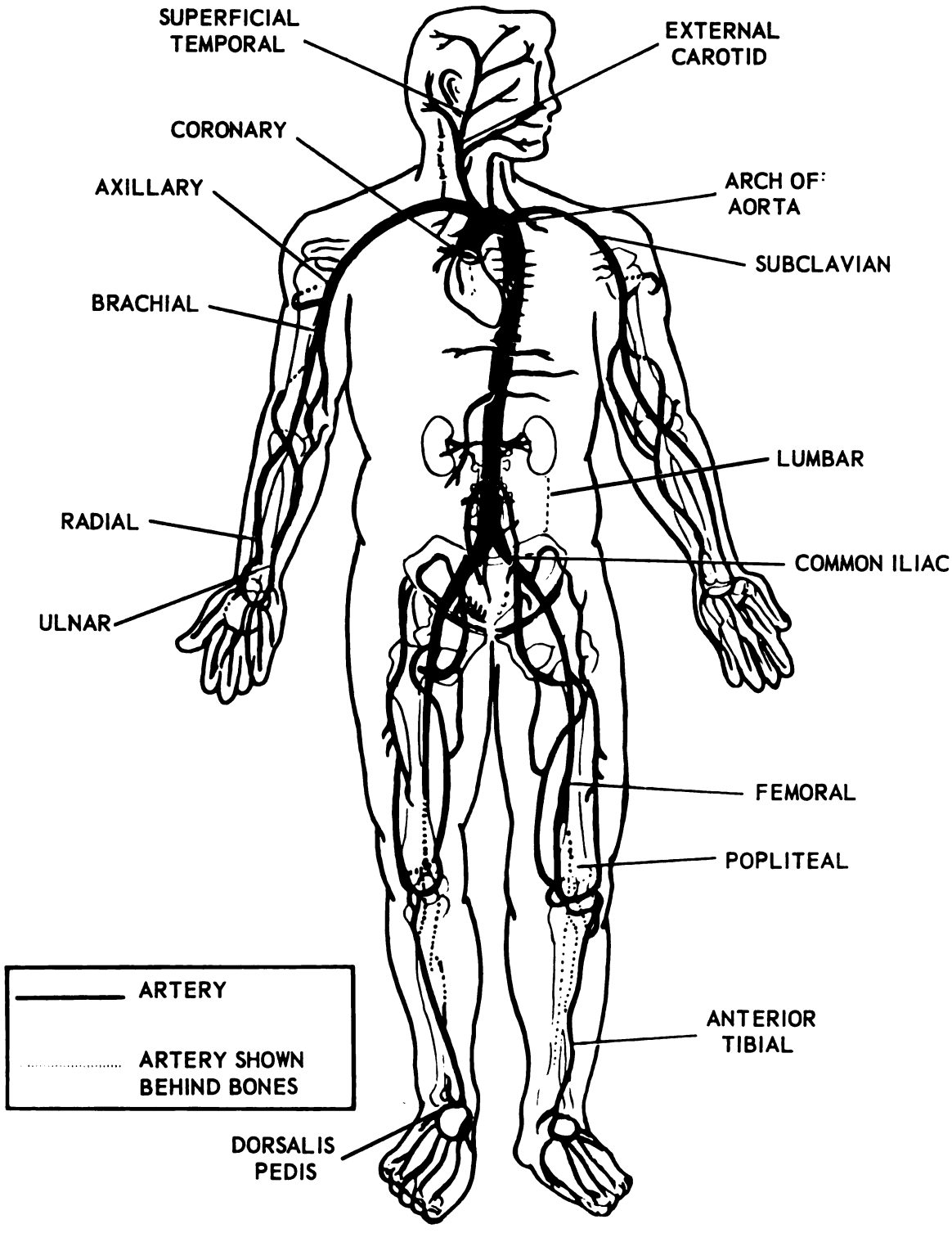


Figure 2-20. Arterial system (diagrammatic).

must often be controlled by clamping and tying off (ligating) the vessel. Some of the principal arteries and the area they supply with blood are—

(1) Carotid arteries, external and internal, supply the neck, head, and brain through their branches.

(2) Subclavian arteries supply the upper extremities.

(3) Femoral arteries supply the lower extremities.

b. Capillaries. Microscopic in size, capillaries

are so numerous that there is at least one or more near every living cell. A single layer of endothelial cells forms the walls of a capillary. Capillaries are the essential link between arterial and venous circulation. The vital exchange of substances from the blood in the capillary with tissue cells takes place through the capillary wall. Blood starts its route back to the heart as it leaves the capillaries.

c. Veins. Veins have thin walls and valves. Formed from the inner vein lining, these valves prevent blood from flowing back toward the capillaries. Venules, the smallest veins, unite into veins of larger and larger size as the blood is collected to return to the heart. The superior vena cava, collecting blood from all regions above the diaphragm, and the inferior vena cava, collecting blood from all regions below the diaphragm, return the venous blood to the right atrium of the heart. Superficial veins lie close to the surface of the body and can be seen through the skin.

(1) The median basilic vein (fig. 2–21) (at the antecubital fossa in the bend of the elbow) is commonly used for venipuncture to obtain blood specimens or to inject solutions of drugs or parenteral fluid intravenously.

(2) The great saphenous vein is the longest

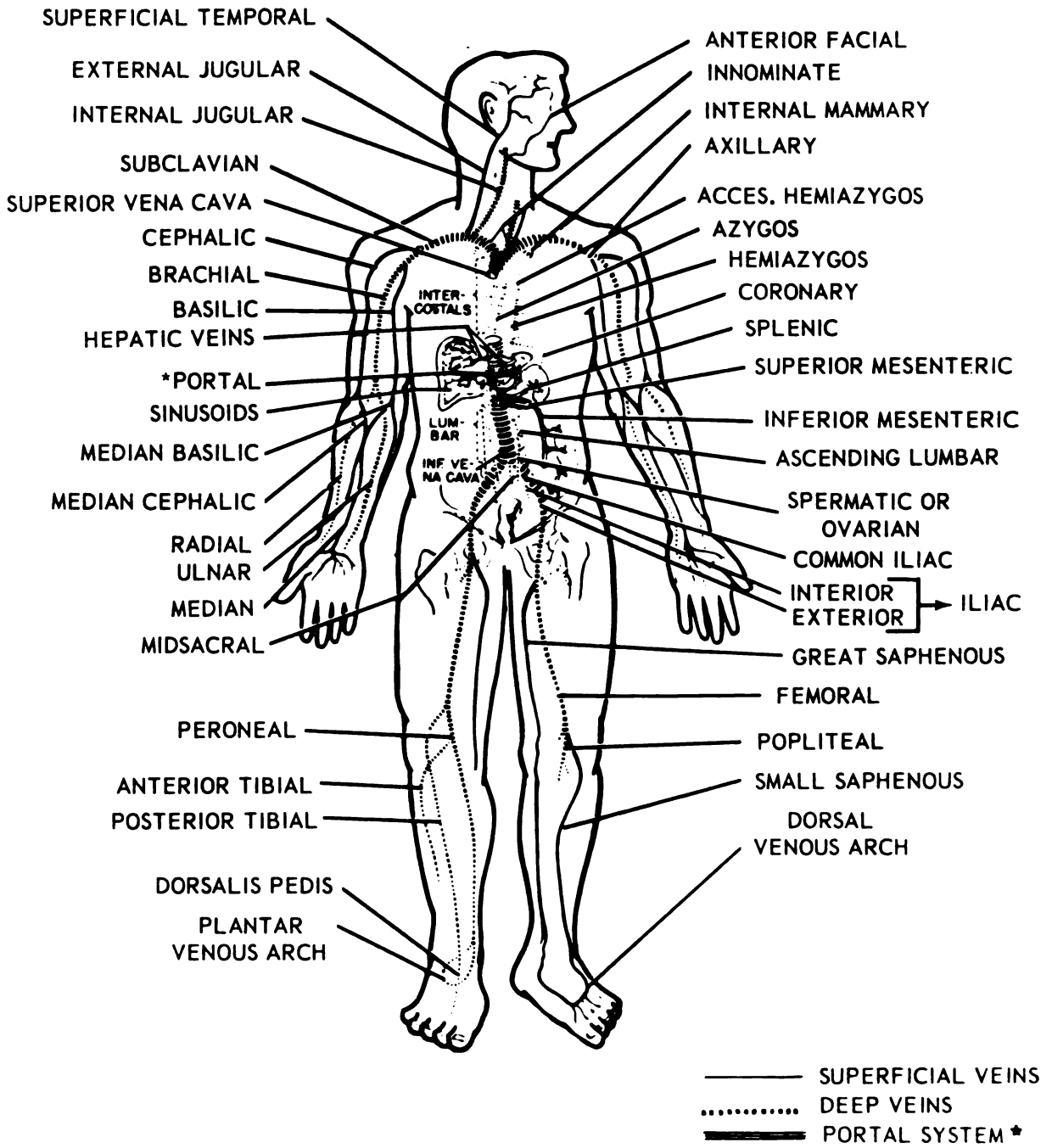


Figure 2–21. Venous system (diagrammatic).

vein in the body, extending from the foot to the groin. The saphenous vein has a long distance to lift blood against the force of gravity when an individual is in standing position. It is therefore susceptible to becoming dilated and stretched and the valves no longer function properly. When this occurs the vein is said to be varicosed.

2-37. Pulse and Blood Pressure

a. Pulse. This is a characteristic associated with the heartbeat and the subsequent wave of expansion and recoil set up in the wall of an artery. Pulse is defined as the alternate expansion and recoil of an artery. With each heartbeat, blood is forced into the arteries causing them to dilate (expand). Then the arteries contract (recoil) as the blood moves further along in the circulatory system. The pulse can be felt at certain points in the body where an artery lies close to the surface. The most common location for feeling the pulse is at the wrist, proximal to the thumb (radial artery) on the palm side of the hand. Alternate locations are in front of the ear (temporal artery), at the side of the neck (carotid artery), and on the top (dorsum) of the foot (dorsalis pedis).

b. Blood Pressure. The force that blood exerts on the walls of vessels through which it flows is called blood pressure. All parts of the blood vascular system are under pressure, but the term blood pressure usually refers to arterial pressure. Pressure in the arteries is highest when the ventricles contract during systole. Pressure is lowest when the ventricles relax during diastole. The brachial artery, in the upper arm, is the artery usually used for blood pressure measurement.

2-38. Lymphatic System

The lymphatic system consists of lymph, lymph vessels, and lymph nodes. The spleen belongs, in part, to the lymphatic system. Unlike the cardiovascular system, the lymphatic system has no pump to move the fluid which it collects, but muscle contractions and breathing movements aid in the movement of lymph through its channels and its return to the blood stream.

a. Lymph and Tissue Fluid. Lymph, fluid found in the lymph vessels, is clear and watery and is similar to tissue fluid, which is the colorless fluid that fills the spaces between tissues, between the cells of organs, and between cells and connective tissues. Tissue fluid serves as the "middleman" for the exchange between blood and body cells. Formed from plasma, it seeps out of capillary walls. The lymphatic system collects tissue fluid, and as lymph, the collected fluid is started on its way for return to the circulating blood.

b. Lymph Vessels. Starting as small blind ducts within the tissues, the lymphatic vessels enlarge to form lymphatic capillaries. These capillaries unite to form larger lymphatic vessels, which resemble veins in structure and arrangement. Valves in lymph vessels prevent backflow. Superficial lymph vessels collect lymph from the skin and subcutaneous tissue; deep vessels collect lymph from all other parts of the body. The two largest collecting vessels are the thoracic duct and the right lymphatic duct. The thoracic duct (fig. 2-22) receives lymph from all parts of the body except the upper right side. The lymph from the thoracic duct drains into the left subclavian vein, at the root of the neck on the left side. The right lymphatic duct drains into a corresponding vein on the right side.

c. Lymph Nodes. Occurring in groups up to a dozen or more, lymph nodes lie along the course of lymph vessels. Although variable in size, they are usually small oval bodies which are composed of lymphoid tissue. Lymph nodes act as filters for removal of infective organisms from the lymph stream. Important groups of these nodes are located in the axilla, the cervical region, the submaxillary region, the inguinal (groin) region, and the mesentric (abdominal) region.

d. Infection and the Lymphatic System. Lymph vessels and lymph nodes often become inflamed as the result of infection. An infection in the hand may cause inflammation of the lymph vessels as high as the axilla (armpit). Sore throat may cause inflammation and swelling of lymph nodes in the neck (submandibular nodes below the jaw and cervical nodes posteriorly).

e. Spleen. The largest collection of lymphoid tissue in the body, the spleen is located high in the abdominal cavity on the left side (LUQ), below the diaphragm and behind the stomach. It is somewhat long and ovoid (egg-shaped). Although it can be removed (splenectomy) without noticeable harmful effects, the spleen has useful functions, such as serving as a reservoir for blood and red blood cells.

2-39. The Blood

Blood is the red body fluid flowing through the arteries, capillaries, and veins. It varies in color

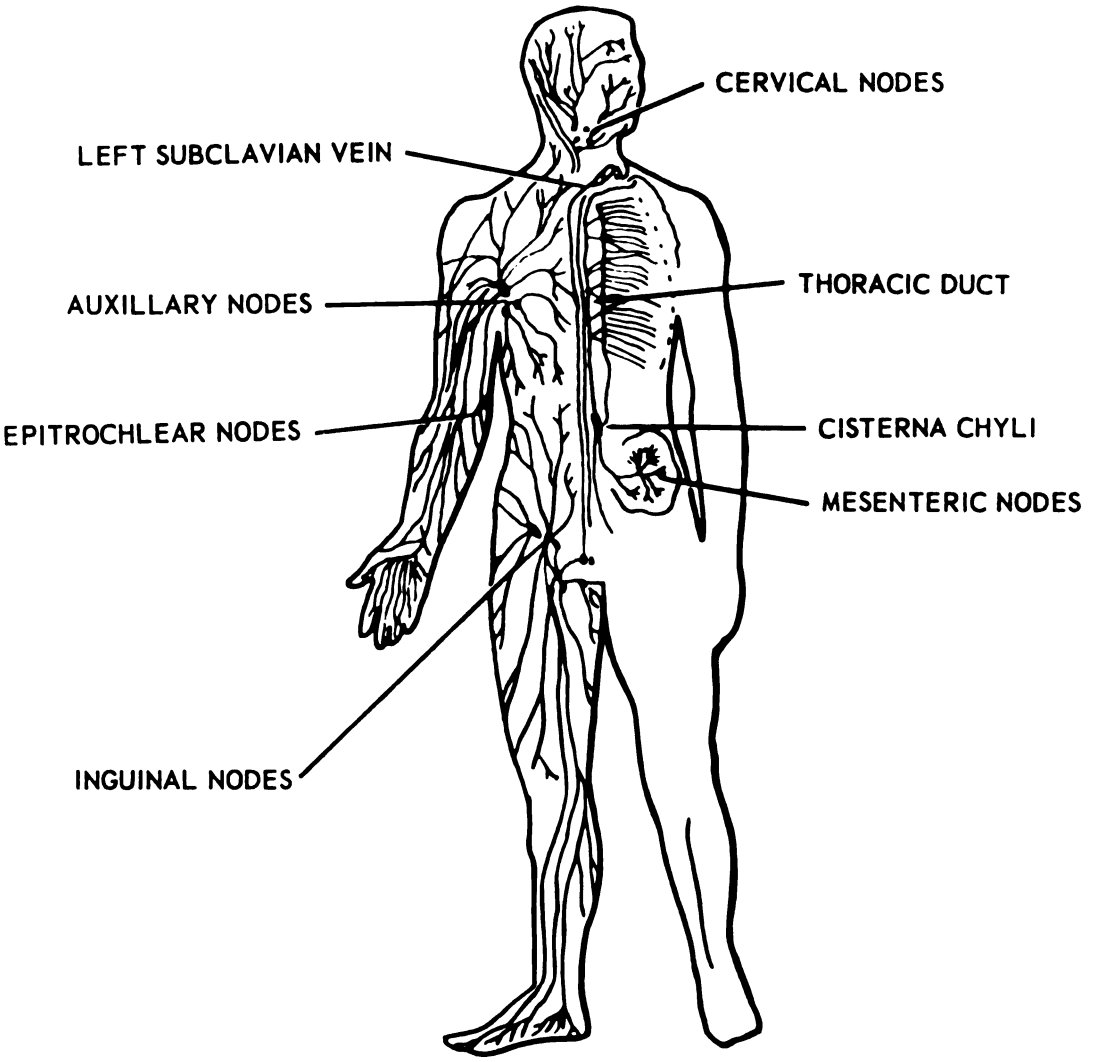


Figure 2-22. Lymphatic system.

from bright red (oxygenated blood) when it flows from arteries, to dark red (deoxygenated blood) when it flows from veins. The average man has about 6000 ml. of blood.

a. Functions of Blood. The six major functions of blood are all carried out when blood circulates normally through the blood vessels. These functions are—

(1) To carry oxygen from the lungs to tissue cells and carbon dioxide from the cells to the lungs.

(2) To carry food materials absorbed from the digestive tract to the tissue cells and to remove waste products for elimination by excretory organs—the kidneys, intestines, and skin.

(3) To carry hormones, which help regulate body functions, from ductless (endocrine) glands to the tissues of the body.

(4) To help regulate and equalize body temperature. Body cells generate large amounts of heat, and the circulating blood absorbs this heat.

(5) To protect the body against infection.

(6) To maintain the fluid balance in the body.

b. Composition of Blood. Blood is made up of a liquid portion, plasma, and formed elements, blood cells, suspended in the plasma.

(1) *Plasma.* Making up more than one-half of the total volume of blood, plasma is the carrier for blood cells and carbon dioxide and other dissolved wastes. It brings hormones and antibodies (protective substances) to the tissues. Other components of plasma are water, oxygen, nitrogen, fat, carbohydrates, and proteins. Fibrinogen, one of the plasma proteins, helps blood clotting. When blood clots, the liquid portion that remains is serum. Blood serum contains no blood cells.

(2) *Blood cells.* The cellular elements in the blood are red cells (erythrocytes, or rbc), white cells (leucocytes, or wbc) and blood platelets (thrombocytes).

2-40. Red Blood Cells (Erythrocytes)

There are about 5,000,000 red blood cells in 1 cubic millimeter (cmm.) of blood. (One cmm. is a very small amount, about 1/25 of a drop). When viewed under a microscope, an individual red blood cell is disc-shaped. An rbc is the only mature body cell that has no nucleus; this fact is important in the diagnosis of some blood disease, because immature red blood cells which do have a nucleus under normal circumstances do not appear in the blood. When nucleated rbc are found, there is a special significance since this may indicate a type of anemia. Red cells are formed in the adult by the red bone marrow in special protected bone areas. Millions of red cells are thought to be destroyed daily, either in the liver, the spleen, the lymph nodes, or in the vascular system itself. In a healthy person, the rate of destruction is equaled by the rate of production, so that a red count of about 5,000,000 per cubic millimeter remains constant. Red blood cells have an average life span of about 90 to 120 days before becoming worn out in service.

a. Hemoglobin. A pigment, hemoglobin, gives red cells their color. Hemoglobin (Hgb) has the power to combine with oxygen, carrying it from the lungs to the tissue cells. Hgb assists in transporting carbon dioxide from the cells to the lungs. This transportation of gases (oxygen and carbon dioxide) is the principal function of red cells. The oxygen content gives arterial blood its bright red color. In order to carry oxygen, hemoglobin needs the mineral, iron, which is ordinarily available in a nutritionally adequate diet.

b. Anemia. The condition known as anemia is due to a reduction in number of red cells or a reduction in the hemoglobin content of red cells.

2-41. White Cells (Leucocytes)

White cells vary in size and shape, and are larger and much fewer in number than red cells. The average number in an adult is 5,000 to 10,000 in 1 cmm. of blood. Their function is primarily one of protection. They can ingest and destroy foreign particles, such as bacteria, in the blood and tissues. This function is called phagocytosis, and the white cells performing it are phagocytes. White cells are capable of ameboid movement and thus can pass through the walls of capillaries into surrounding tissues. This ability to enter tissue makes them very useful in fighting infection—an area of infection is characterized by a great increase of white cells which gather about the site to destroy bacteria. An example of this is seen in an ordinary boil (furuncle). The pus contained in the boil is made up largely of white cells, plus bacteria and dissolved tissue. Many of the white cells are killed in their struggle with invading bacteria.

a. Kinds of White Cells. There are several kinds of white cells. The most numerous, neutrophils, make up about 65 percent of all white cells and are called polymorphonuclear granulocytes. Certain very potent drugs interfere with the formation of these valuable cells, and the condition agranulocytosis (absence of granulocytes) develops. When drugs with this known toxic effect must be used in treatment of a disease, the doctor orders frequent white cell blood counts as an important part of the treatment. Neutrophils are produced by the red bone marrow.

b. Leucocytosis. In various diseases, the number of white cells in the blood stream may increase considerably, especially in acute infections. This increase is leucocytosis, and it is an important body defense response. A common condition where there is a leucocytosis is acute appendicitis. (A subnormal white count is known as leucopenia.)

c. Lymphocytes. Lymphocytes are white cells produced in lymphoid tissue. One type of lymphocyte is a monocyte, the largest white cells.

2-42. Blood Platelets (Thrombocytes)

Blood platelets, which are smaller than red blood cells, are thought to be fragments of cells formed in the bone marrow. Platelets number about 300,000 per cmm. of blood. Their main function is to aid in the coagulation of blood at the site of a wound. Platelets when injured release a substance to hasten formation of a blood clot.

2-43. Coagulation of Blood

a. Blood coagulation, or clotting, is the body's major method of preventing excessive loss of

blood when the walls of a blood vessel are broken or cut open. When undisturbed, blood circulates in its vascular system without showing a tendency to clot. However, when blood leaves its natural environment, certain physical and chemical factors are changed and it begins to clot almost at once. At first the clot is soft and jellylike, but it soon becomes firm and acts as a plug, preventing the further escape of blood.

b. It takes 3 to 5 minutes for blood to clot, but sometimes it is necessary to hold back the clotting process. This is done with drugs called anticoagulants.

2-44. Hemorrhage

Hemorrhage is bleeding, particularly excessive bleeding, from blood vessels due to a break in their walls. It may be caused by a wound or by disease. Whatever its cause, it can be a serious threat to life and calls for prompt control. Hemorrhage can occur either externally or internally. External hemorrhage is bleeding that can be seen, such as bleeding from a wound. In external hemorrhage, blood escapes to the outside and spills onto the surface of some part of the body. Internal hemorrhage happens inside the body, spilling blood into tissues, a body cavity, or an organ. It can occur without any blood being seen outside the body. Bleeding in some internal areas is evident, however, when blood accumulates in tissues (forming a hematoma), or is vomited, coughed up, or excreted in urine or feces.

a. Effects of Hemorrhage. The effects of hemorrhage depend on the amount of blood lost, the rate of loss, and the area into which internal bleeding occurs. Generally, blood pressure drops and breathing and pulse rates become rapid. When blood is lost rapidly, as in bleeding from an artery, blood pressure may drop suddenly. If only small vessels are injured and bleeding is slow, a large amount of blood may be lost without an immediate drop in blood pressure.

b. Natural Measures to Control Hemorrhage. When a blood vessel is opened, the body reacts with measures to check bleeding. Two natural body responses to bleeding are clotting of blood and retraction and constriction of blood vessels. The muscle in an injured artery contracts, and if the artery is severed, the contraction pulls the damaged vessel back into the tissues, thus tending to close the leak. As a rule, these natural responses must be helped by artificial means for controlling hemorrhage and for restoring the blood. Artificial means for controlling external hemorrhage include two important first aid measures—elevation of bleeding extremities and applying pressure dressings.

2-45. Blood Types

All human blood may be divided into four main types or groups—O, A, B, AB. This system of typing is used to prevent incompatible blood transfusion, which causes serious reactions and sometimes death. Certain types of blood are incompatible or not suited to each other if combined. Two bloods are said to be incompatible when the plasma or serum of one blood causes clumping of the cells of the other. Two bloods are said to be compatible and safe for transfusion if the cells of each can be suspended in the plasma or serum of the other without clumping. Blood typing and cross-matching are done by highly trained laboratory technicians. Table 2-2 shows blood compatibilities and incompatibilities.

a. Importance of Blood Types. From table 2-2, it is evident that if the donor's blood is type "O" it is compatible with all types of recipient blood; or, in other words, type "O" is the universal donor. If the recipient's blood is type "AB", it is compatible with all types of donor blood, or, in other words, type "AB" is the universal recipient. When a blood transfusion is given, the blood type of both donor and recipient should be identical, and their compatibility must be proved by a cross-matching test. However, when blood of the same type is not available and death may result if transfusion is delayed, a type "O" donor (universal donor) may be used if the cross-matching is satisfactory.

Table 2-2. Blood Types

Donor	Recipient			
	O	A	B	AB
O	Compatible	Compatible	Compatible	Compatible
A	Incompatible	Compatible	Incompatible	Compatible
B	Incompatible	Incompatible	Compatible	Compatible
AB	Incompatible	Incompatible	Incompatible	Compatible

b. Rh Factor. In addition to blood grouping and cross-matching for compatibility, the Rh factor must be considered. The Rh factor is carried in red cells, and about 85 percent of all individuals have this factor and are, therefore, Rh positive. Individuals who do not have the Rh factor are Rh negative. As a general rule, Rh negative blood can be given to anyone, provided it is compatible in the ABO typing system, but Rh positive blood should not be given to an Rh negative individual.

Section VII. THE RESPIRATORY SYSTEM

2-46. Introduction

a. The cells of the body require a constant supply of oxygen to carry on the chemical processes necessary to life. As a result of these processes, a waste product, carbon dioxide, is formed that must be removed from the body. Oxygen and carbon dioxide are continually being exchanged, both between the body and the atmosphere and within the body, by the process known as respiration. The system which performs this exchange of gases is the respiratory system.

b. The respiratory system consists of the lungs and a series of air passages that connect the lungs to the outside atmosphere. The organs serving as air passages are the nose, the pharynx, the larynx, the trachea, and the bronchi. They carry air into the depths of the lungs and end there in thin-walled sacs, the alveoli, where carbon dioxide is exchanged for oxygen.

2-47. Structure and Function of the Respiratory System

a. Nose. The nose consists of two portions, one external and the other internal (nasal cavity). The external nose is a triangular framework of bone and cartilage covered by skin. On its under surface are the nostrils, the two external openings of the nasal cavity. The nasal cavity is divided in two by the nasal septum, and is separated from the mouth by the palate. Inhaled air is warmed, moistened, and filtered by the nasal cavity. The filtering is done by cilia of the mucous membrane lining the nasal passages. Cilia are numerous, long, microscopic processes which beat or wave together and cause movement of materials across the surface and out of the body. Ciliary movement is important in draining the sinuses.

b. Air Sinuses. Air spaces in several bones of the face and head open into the nasal cavity. They serve as resonance chambers in the production of voice and decrease the weight of the skull. These air sinuses (fig. 2-23) take the name of the bone in which they are found. They are lined with mucous membrane continuous with that lining the nasal cavity.

c. Pharynx. The pharynx, or throat, connects the nose and mouth with the lower air passages and esophagus. It is divided into three parts: the nasopharynx, the oropharynx, and the laryngopharynx. It is continued as the esophagus. Both air and food pass through the pharynx. It carries air from the nose to the larynx, food from the mouth to the esophagus. The walls of the pharynx contain masses of lymphoid tissues called the adenoids and tonsils.

d. Larynx. The larynx, or voice box, connects the pharynx with the trachea (fig. 2-23). It is located in the upper and anterior part of the neck. The larynx is shaped like a triangular box. It is made of 9 cartilages joined by ligaments and controlled by skeletal muscles. The thyroid cartilage is the largest. It forms the landmark in the neck called the "Adam's apple." Another of the cartilages is the epiglottis. During swallowing, the epiglottis closes the larynx, the soft palate closes the nasal cavity, and the lips close the mouth. Thus food is forced into the only remaining opening, the esophagus. Except during swallowing or when the throat is voluntarily closed, the air passages are wide open and air is free to pass from the mouth and nose into the lungs. Two membranous bands in the wall of the larynx are called vocal cords. Vibration of the vocal cords produce sounds. The cricoid cartilage, located just below the prominent thyroid cartilage, is joined to the thyroid cartilage by a membrane. The emergency procedure of cricothyroidotomy to produce an airway is performed by puncturing this connecting membrane.

e. Trachea. The trachea, or windpipe, is a tube held open by cartilaginous rings. It carries air from the larynx to the bronchi (fig. 2-24). The trachea is lined with cilia and mucous glands whose secretions provide a sticky film to keep dust and dirt out of the lungs.

f. Bronchi. The trachea divides to form the two bronchi. One bronchus enters each lung and there divides into many small air passages, called bronchioles or bronchial tubes which lead air into the final air spaces within the lungs.

g. The Lungs.

(1) The lungs (fig. 2-24) are the soft, air-filled, essential organs of respiration. They are elastic structures, almost filling the left and right

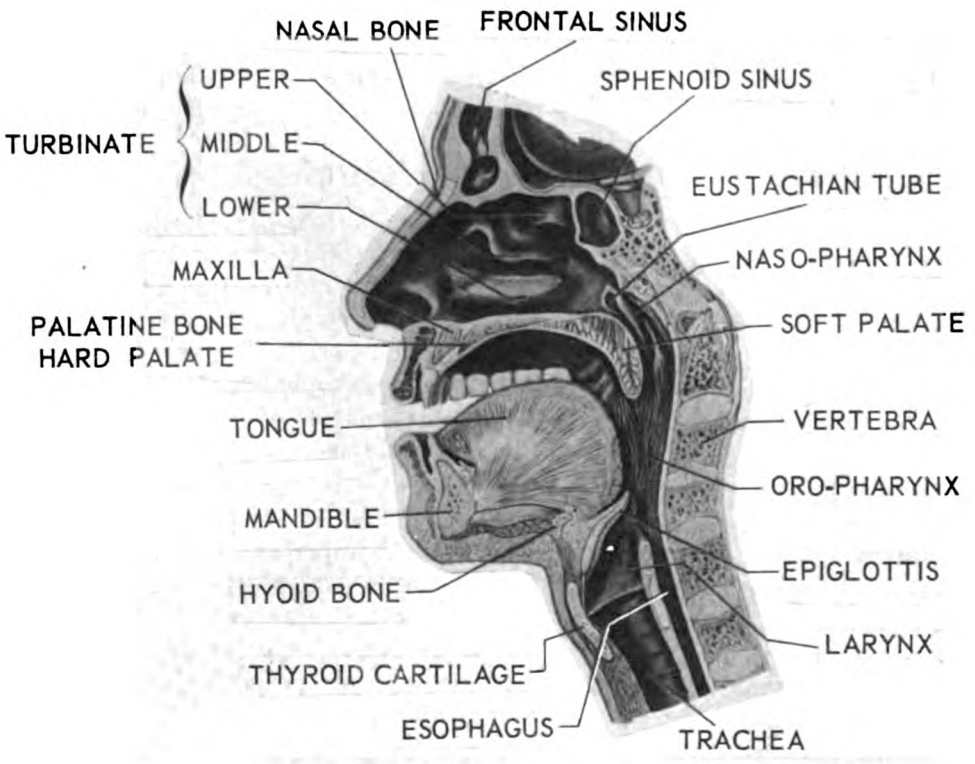


Figure 2–23. Upper respiratory tract.

sections of the thoracic cavity. The upper, pointed margin of each lung, the apex, extends above the clavicle. The lower border, the base, fits upon the dome-shaped surface of the diaphragm. Between the two lungs is the mediastinum (fig. 2–25), the central thoracic cavity containing the heart, great blood vessels, esophagus, and lower trachea. The right lung has three lobes; the left lung has two. Within each lobe are separate branches of the main bronchus, and the lobes themselves are divided into segments. The last subdivisions of the air passages to the lungs are alveoli, which are surrounded by networks of capillaries. The alveoli are air chambers.

(2) Each lung is inclosed by a membranous sac formed of two layers of serous membranes called the pleurae (or singly, pleura). One layer covers the lungs (visceral pleura); the other lines the chest cavity (parietal pleura). If air enters the pleural sac, it expands to form a large cavity and the lung collapses (fig. 2–25). This condition of air in the chest outside the lungs is called pneumothorax. If air can move through a hole into the chest, it is called open pneumothorax, a life-endangering condition. An open pneumothorax can result from a bullet wound, stab wound, or other injury that makes a hole in the chest.

2–48. Physiological Process of Respiration

The walls of the alveoli are very thin and it is here that oxygen passes into the bloodstream and carbon dioxide is taken from it. This exchange of oxygen and carbon dioxide in the lungs is called external respiration. The oxygen which enters the blood is carried by the red blood cells in chemical combination with hemoglobin. The blood, oxygenated in the lungs, returns to the heart, then is pumped through the arteries to the capillaries. Here oxygen from the blood passes to the tissue cells and carbon dioxide from the cells passes into the blood to be carried back by the veins to the heart. The exchange of gases between the capillary blood and the tissue cells is called internal respiration.

2–49. Mechanical Process of Respiration

The act of breathing, the cycle of inspiration and expiration, is repeated about 16 to 20 times per minute in an adult at rest. Breathing is regulated primarily by a respiratory center in the brain. The respiratory center is sensitive to changes in blood composition, temperature, and pressure, and adjusts breathing according to the body's needs.

a. Inspiration. This is an active movement. The diaphragm, the large, dome-shaped muscle form-

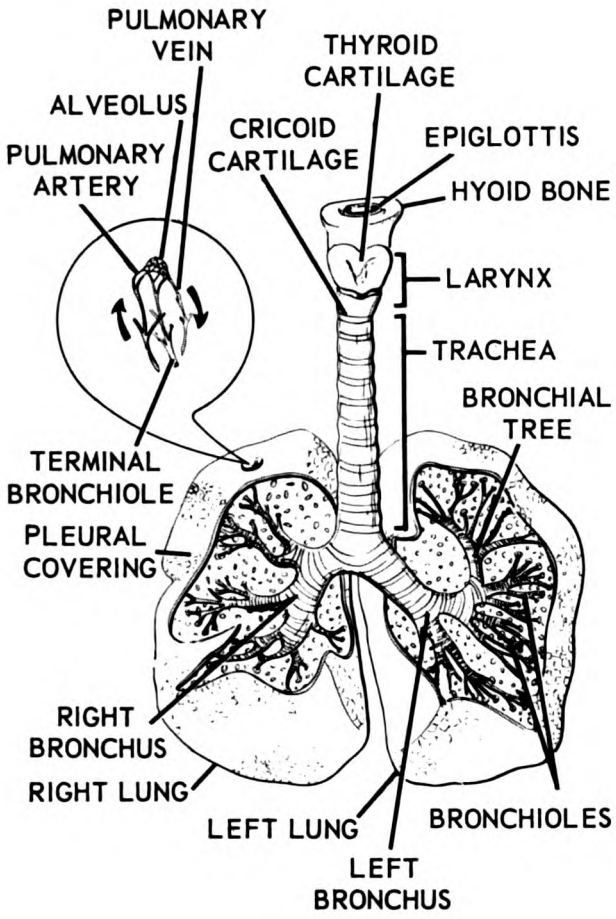


Figure 2-24. Lungs and air passages.

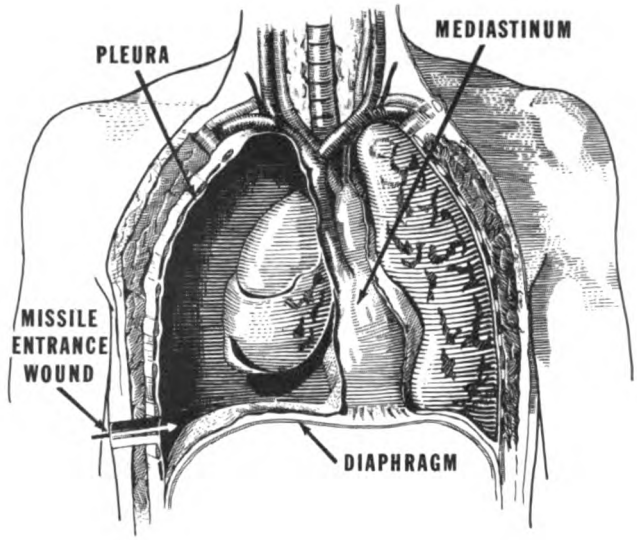


Figure 2-25. Collapse of lungs by a sucking chest wound.

ing the floor of the thoracic cavity, contracts, flattening its domed upper surface and increasing the size of the cavity. At about the same time, muscles attached to the ribs (intercostals) contract to elevate and spread the ribs. This further increases the size of the cavity. Air rushes into the lungs and they expand, filling the enlarged cavity.

b. Expiration. At rest, during quiet breathing, expiration is a passive movement. The diaphragm, as it relaxes, is forced upward by intra-abdominal pressure. Muscles attached to the ribs relax, permitting the chest to flatten. These actions reduce the size of the thoracic cavity, allowing the elastic recoil of the stretched lungs to drive out the air. More air can be expelled from the lungs by forced expiration. This is done by contraction of the abdominal muscles, forcing the diaphragm upward, and of the muscles attached to the ribs, flattening the chest to compress the lungs and drive out the air. When breathing becomes forced, as with exercise, expiration also becomes active.

c. Volume. About 500 milliliters (1 pint) of air are inhaled during normal respiration. By deep inspiration it is possible to inhale an additional 1,500 milliliters.

d. Sounds. Sounds caused by air moving in the lungs change with some diseases. These changes, heard with a stethoscope, assist in diagnosis of diseases of the lungs such as pneumonia or tuberculosis.

Section VIII. THE DIGESTIVE SYSTEM

2-50. Description

a. The digestive system is made up of the alimentary tract (food passage) and the accessory organs of digestion. Its main functions are to ingest and carry food so that digestion and absorption can occur, and to eliminate unused waste material. The products of the accessory organs help to prepare food for its absorption and use (metabolism) by the tissues of the body.

b. Digestion consists of two processes, one mechanical and the other chemical. The mechanical part of digestion includes chewing, swallowing, peristalsis, and defecation. The chemical part of digestion consists of breaking foodstuffs into simple components which can be absorbed and used by the body. In this process, foodstuffs are broken down by enzymes, or digestive juices, formed by digestive glands. Carbohydrates are broken into simple sugar (glucose). Fats are changed into fatty acids. Proteins are converted to amino acids.

2–51. Structure of Digestive System (fig. 2–26)

a. The alimentary canal is about 28 feet long, extending from the lips to the anus, and is divided as follows:

Mouth cavity:
- Teeth
- Tongue

Pharynx
Esophagus
Stomach
Small intestine
Large intestine (colon)
Rectum
Anus

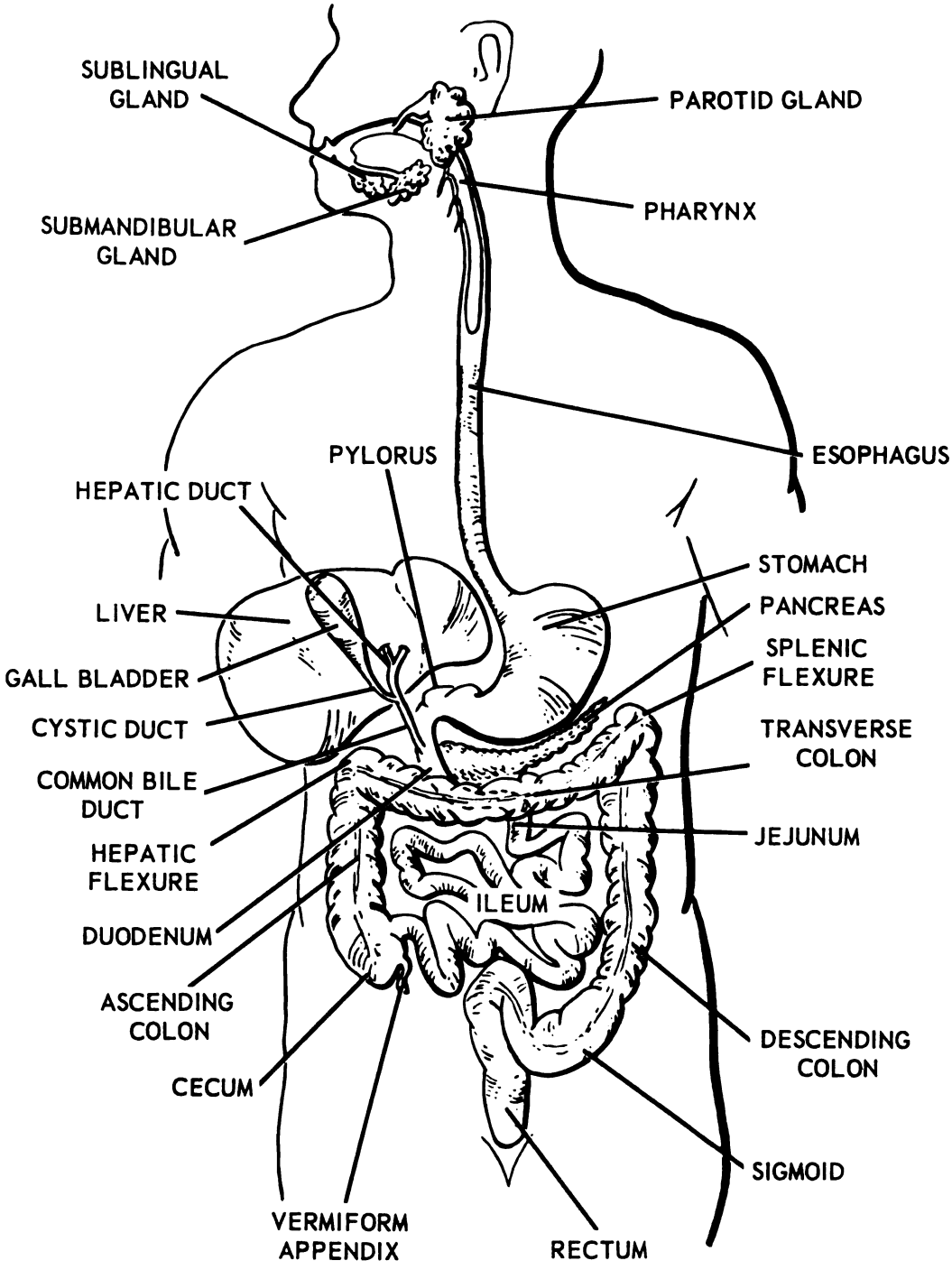


Figure 2–26. Digestive system.

b. The accessory organs that aid the process of digestion are: the salivary glands, pancreas, liver, gall bladder, and intestinal glands.

2-52. The Mouth

The mouth, or oral cavity, is the beginning of the digestive tract. Here food taken into the body is broken into small particles and mixed with saliva so that it can be swallowed.

a. Teeth.

(1) A person develops two sets of teeth during his life, a deciduous (or temporary) set and a permanent set. There are 20 deciduous teeth and these erupt during the first 3 years of life. They are replaced during the period between the 6th and 14th years by permanent teeth. There are 32 permanent teeth in the normal mouth; 4 incisors, 2 cuspids, 4 bicuspids, and 6 molars in each jaw. Each tooth is divided into two main parts: the crown, that part which is visible above the gums; and the root, that part which is not visible and which is embedded in the bony structure of the jaw. The crown of the tooth is protected by enamel. Tooth decay is from the outside in; once the protective enamel is broken, microorganisms attack the less resistant parts of the tooth.

(2) The primary function of the teeth is to chew or masticate food. Secondarily, the teeth help to modify sound as produced by the larynx and as used in forming words.

b. Salivary Glands. These glands are the first accessory organs of digestion. There are three pairs of salivary glands. They secrete saliva into the mouth through small ducts. One pair, the parotid glands, is located at the side of the face below and in front of the ears. The second pair, the submandibular glands, lies on either side of the mandible. The third pair, the sublingual glands, lies just below the mucous membrane in the floor of the mouth. The flow of saliva is begun in several ways. Placing food in the mouth affects the nerve endings there. These nerve endings stimulate cells of the glands to excrete a small amount of thick fluid. The sight, thought, or smell of food also activates the brain and induces a large flow of saliva. About 1,500 ml. of saliva are secreted daily. The saliva moistens the food, which makes chewing easier. It lubricates the food mass to aid in the act of swallowing. Saliva contains two enzymes, chemical ferments which change foods into simpler elements. The enzymes act upon starches and break them down into sugars.

c. Tongue. The tongue is a muscular organ attached at the back of the mouth and projecting upward into the oral cavity. It is concerned in taste, speech, mastication, salivation, and swallowing. After food has been masticated, the tongue propels it from the mouth into the pharynx. This is the first stage of swallowing. Mucus secreted by glands in the tongue lubricates the food and makes swallowing easier. Taste buds situated in the tongue make it the principal organ of the sense of taste. Stimulation of the taste buds causes secretion of gastric juices needed for the breaking down of food in the stomach.

2-53. Pharynx

The pharynx is a muscular canal which leads from the nose and mouth to the esophagus. The passage of food from the pharynx into the esophagus is the second stage of swallowing. When food is being swallowed, the larynx is closed off from the pharynx to keep food from getting into the respiratory tract.

2-54. The Esophagus

The esophagus is a muscular tube about 10 inches long, lined with a mucous membrane. It leads from the pharynx through the chest to the upper end of the stomach (fig. 2-26). Its function is to complete the act of swallowing. The involuntary movement of material down the esophagus is carried out by the process known as peristalsis, which is the wavelike action produced by contraction of the muscular wall. This is the method by which food is moved throughout the alimentary canal.

2-55. The Stomach

The stomach is an elongated pouchlike structure (fig. 2-26) lying just below the diaphragm, with most of it to the left of the midline. It has three divisions: the fundus, the enlarged portion to the left and above the entrance of the esophagus; the body, the central portion; and the pylorus, the lower portion. Circular sphincter muscles which act as valves guard the opening of the stomach. (The cardiac sphincter is at the esophageal opening, and the pyloric sphincter is at the junction of the stomach and the duodenum, the first portion of the small intestine.) The cardiac sphincter prevents stomach contents from re-entering the esophagus except when vomiting occurs. In the digestive process (fig. 2-27), two of the important functions of the stomach are—

a. It acts as a storehouse for food, receiving fairly large amounts, churning it, and breaking it down further for mixing with digestive juices. Semiliquid food is released in small amounts by the pyloric valve into the duodenum, the first part of the small intestine.

b. The glands in the stomach lining produce gastric juices (which contain enzymes) and hydrochloric acid. The enzymes in the gastric juice start the digestion of protein foods, milk, and fats. Hydrochloric acid aids enzyme action. The mucous membrane lining the stomach protects the stomach itself from being digested by the strong acid and powerful enzymes.

2-56. Small Intestine

The small intestine is a tube about 22 feet long. The intestine is attached to the margin of a thin band of tissue called the mesentery, which is a portion of the peritoneum, the serous membrane lining the abdominal cavity. The mesentery supports the intestine, and the vessels which carry blood to and from the intestine lie within this membrane. The other edge of the mesentery is drawn together like a fan; the gathered margin is attached to the posterior wall of the abdomen. This arrangement permits folding and coiling of the intestine so that this long organ can be packed into a small space. The intestine is divided into three continuous parts: duodenum, jejunum, and ileum. It receives digestive juices from three accessory organs of digestion: the pancreas, liver, and gall bladder (fig. 2-26).

a. Pancreas. The pancreas is a long, tapering organ lying behind the stomach. The head of the gland lies in the curve of the small intestine near the pyloric valve. The body of the pancreas extends to the left toward the spleen. The pancreas secretes a juice which acts on all types of food. Two enzymes in pancreatic juice act on proteins. Other enzymes change starches into sugars. Another enzyme changes fats into their simplest forms. The pancreas has another important function, the production of insulin (para 2-83).

b. Liver. The liver is the largest organ in the body. It is located in the upper part of the abdomen with its larger (right) lobe to the right of the midline. It is just under the diaphragm and above the lower end of the stomach. The liver has several important functions. One is the secretion of bile, which is stored in the gall bladder and discharged into the small intestine when digestion is in process. The bile contains no enzymes but it breaks up the fat particles so that enzymes can act faster. The liver performs other important functions. It is a storehouse for the sugar of the body (glycogen) and for iron and vitamin B. It plays a part in the destruction of bacteria and wornout red blood cells. Many chemicals such as poisons or medicines are detoxified by the liver; others are excreted by the liver through bile ducts. The liver manufactures part of the proteins of blood plasma. The blood flow in the liver is of special importance. All the blood returning from the spleen, stomach, intestines, and pancreas is detoured through the liver by the portal vein in the portal circulation (fig. 2-17). Blood drains from the liver by hepatic veins which join the inferior vena cava.

c. Gall Bladder. The gall bladder is a dark green sac, shaped like a blackjack and lodged in a hollow on the underside of the liver. Its ducts join with the duct of the liver to conduct bile to the upper end of the small intestine. The main function of the gall bladder is the storage and concentration of the bile when it is not needed for digestion.

d. Ileum. Most of the absorption of food takes place in the ileum. The walls of the ileum are covered with extremely small, finger-like structures called villi which provide a large surface for absorption. After food has been digested, it is absorbed into the capillaries of the villi. Then it is carried to all parts of the body by the blood and lymph.

2-57. Large Intestine (Colon)

a. The large intestine is about 5 feet long. The cecum (fig. 2-26), located on the lower right side of the abdomen, is the first portion of the large intestine into which food is emptied from the small intestine. The appendix extends from the lower portion of the cecum and is a blind sac. Although the appendix usually is found lying just below the cecum, by virtue of its free end it can extend in several different directions, depending upon its mobility.

b. The colon extends along the right side of the abdomen from the cecum up to the region of the liver (ascending colon). There the colon bends (hepatic flexure) and is continued across the upper portion of the abdomen (transverse colon) to the spleen. The colon bends again (splenic flexure) and goes down the left side of the abdomen

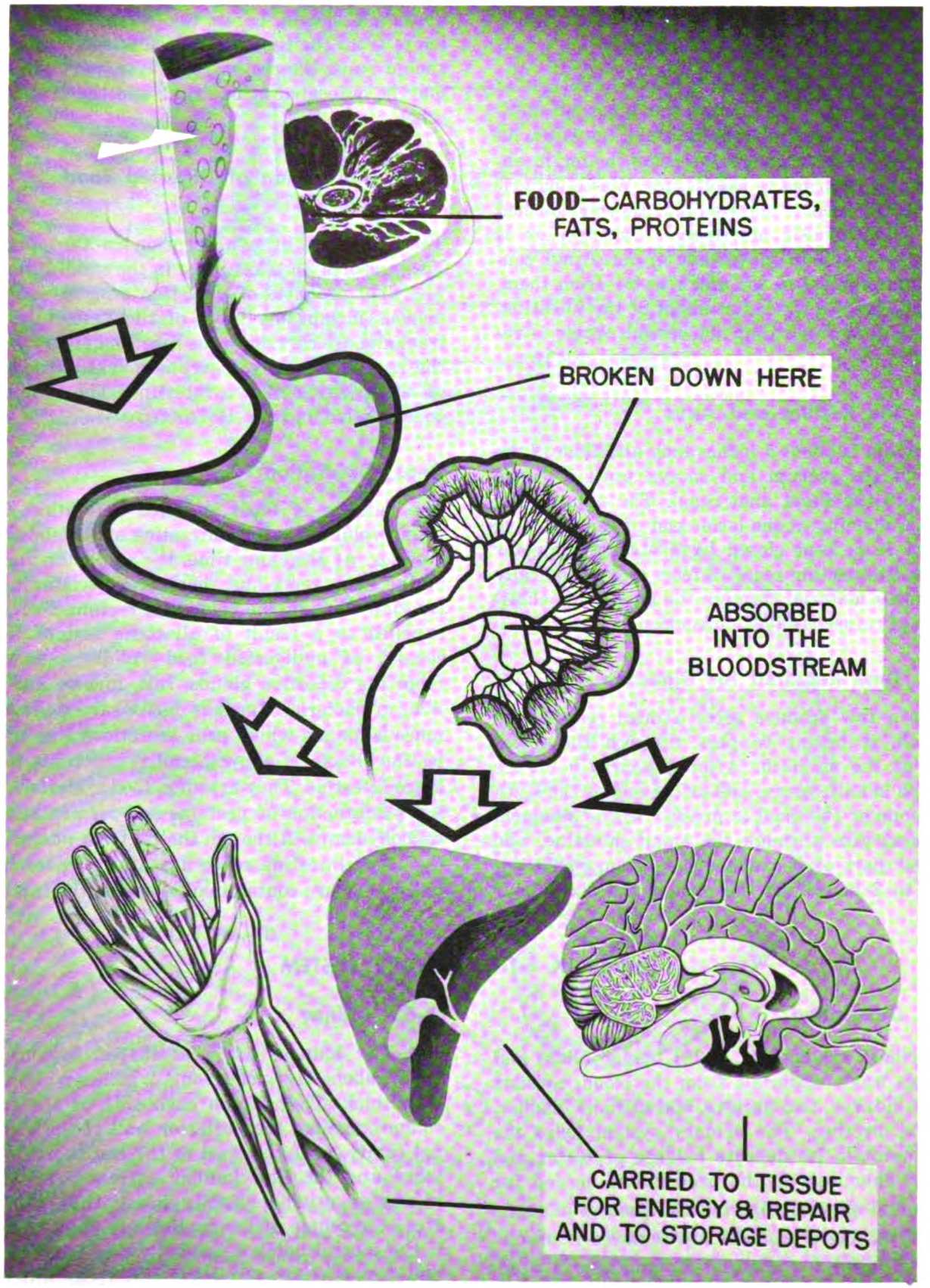

FOOD—CARBOHYDRATES, FATS, PROTEINS
BROKEN DOWN HERE
ABSORBED INTO THE BLOODSTREAM
CARRIED TO TISSUE FOR ENERGY & REPAIR AND TO STORAGE DEPOTS

Figure 2–27. Assimilation of food.

(descending colon). The last portion makes an S curve (sigmoid) toward the center and posterior of the abdomen and ends in the rectum.

c. The main function of the large intestine is the recovery of water from the mass of undigested food it receives from the small intestine. As this mass passes through the colon, water is absorbed and returned to the tissues. Waste materials, or feces, become more solid as they are pushed along by peristaltic movements. Constipation is caused by delay in movement of intestinal contents and removal of too much water from them. Diarrhea results when movement of the intestinal contents is so rapid that not enough water is removed.

2–58. The Rectum and Anus

The rectum is about 5 inches long and follows the curve of the sacrum and coccyx until it bends back into the short anal canal. The anus is the external opening at the lower end of the digestive system. It is kept closed by a strong sphincter muscle. The rectum receives feces and periodically expels this material through the anus. This elimination of refuse is called defecation.

2–59. Time Required for Digestion

Within a few minutes after a meal reaches the stomach, it begins to pass through the lower valve of the stomach. After the first hour the stomach is half empty, and at the end of the sixth hour none of the meal is present in the stomach. The meal goes through the small intestine, and the first part of it reaches the cecum in 20 minutes to 2 hours. At the end of the sixth hour most of it should have passed into the colon; in 12 hours all should be in the colon. Twenty-four hours from the time when food is eaten, the meal should reach the rectum. However, part of a meal may be defecated at one time and the rest at another.

2–60. Absorption of Digested Food (fig. 2–27)

There is very little absorption in the stomach. Most absorption takes place in the small intestine. The final products of digestion pass through the mucous membrane lining of the gastrointestinal tract and are carried to the liver and from there to the rest of the body. There is marked absorption of water in the large intestine. The residue is concentrated and expelled as feces.

2–61. Defecation

The passage of feces is called defecation. It is begun voluntarily by contraction of the abdominal muscles. At the same time, the sphincter muscles of the anus relax and there is a peristaltic contraction wave of the colon and rectum. Feces are expelled as a result of all these actions. Feces consist of undigested food residue, secretions from the digestive glands, bile, mucus, and millions of bacteria. Mucus is derived from the many mucous glands which pour secretions into the intestine. Bacteria are especially numerous in the large intestine. They act upon food material, causing putrefaction of proteins and fermentation of carbohydrates. Although the bacteria normally in the large intestine serve a useful purpose internally, they are contaminants outside the intestine.

Section IX. THE URINARY SYSTEM

2–62. Description

The urinary system (fig. 2–28), which filters and excretes waste materials from the blood, consists of two kidneys, two ureters, one urinary bladder, and one urethra. The urinary system helps the body maintain its delicate balance of water and various chemicals in the proportions needed for health and survival. During the process of urine formation, waste products are removed from circulating blood for elimination, and useful products are returned to the blood.

2–63. Kidney

a. The kidneys are bean-shaped organs (fig. 2–28), about 4½ inches long, 2 inches wide, and 1 inch thick. They lie on each side of the spinal column, against the posterior wall of the abdominal cavity, near the level of the last thoracic vertebra and the first lumbar vertebra. The right kidney is usually slightly lower than the left. Near the center of the medial side of each kidney is the central notch or hilum, where blood vessels and nerves enter and leave and from which the ureter leaves.

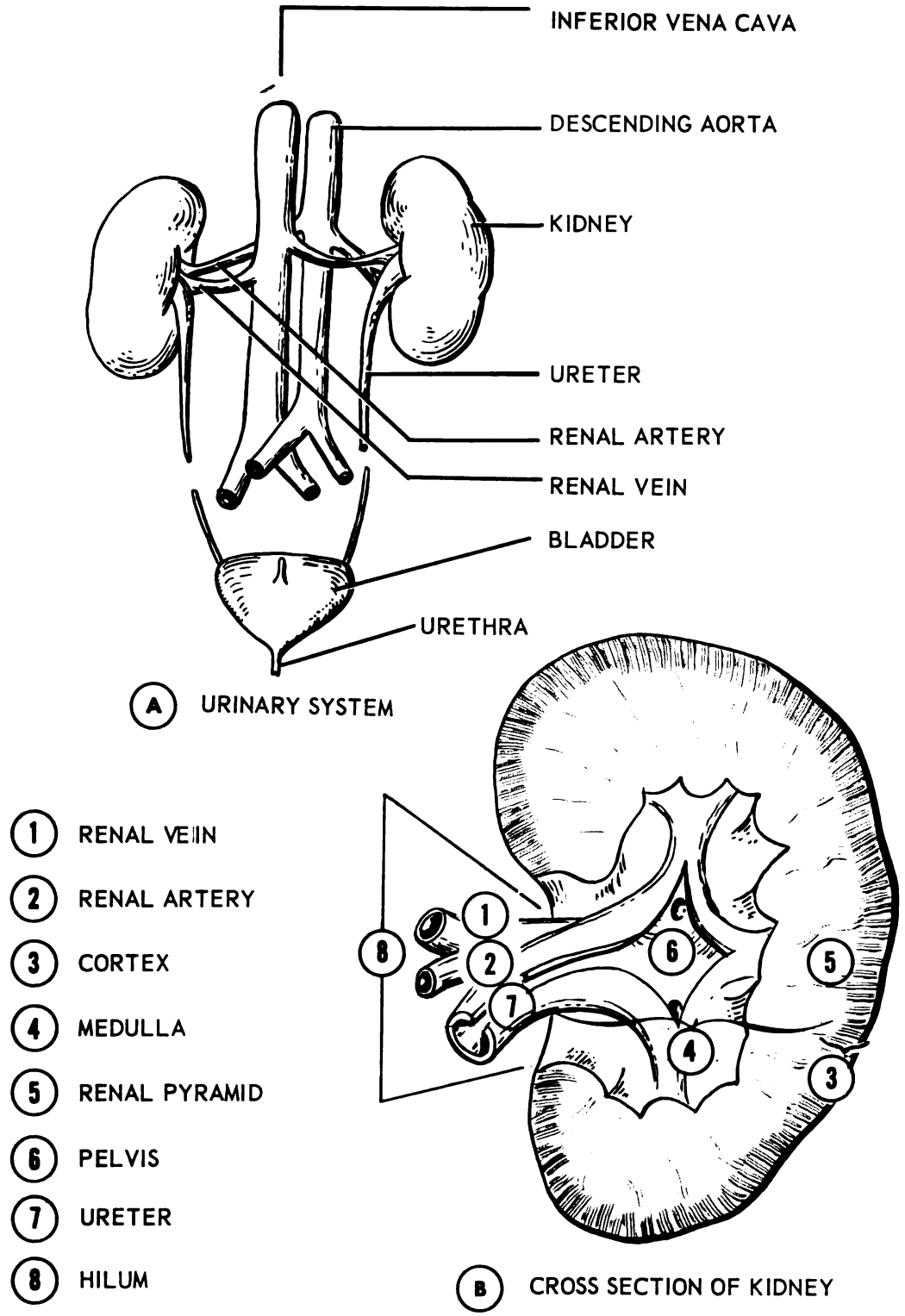


Figure 2–28. Urinary system and cross section of kidney.

b. The kidney is composed of an outer shell or cortex, and an inner layer, the medulla. The cortex is made of firm, reddish-brown tissue containing millions of microscopic filtration plants, called nephrons. Each nephron is a urine-forming unit. The nephron units receive and filter all the body's blood about once every 12 minutes. During this period, they draw off and filter the liquid portion of blood, remove liquid wastes (urine), and return the usable portion to the circulation to maintain the body's fluid balance.

(1) Nephrons are very complicated struc-

tures. Each nephron has a capsule containing a cluster of capillaries called glomerulus. Leading from the capsule is a continuous looped tubule. The glomerulus filters the blood; the water, salts, waste products, and usable products pass from the capsule to the tubule; usable products and water are reabsorbed; and the final waste product, urine, drains from the last loop of the tubule. The glomerulus, the capsule, and the loops of tubule together form a nephron. Each part is essential for the coordinated filtration, reabsorption, and excretion process.

(2) Channels called collecting tubules form larger tubes and deliver the urine to the pelvis of the kidney.

2-64. Ureters

The pelvis of each kidney is drained by a ureter, a muscular tube extending from the hilus to the posterior portion of the urinary bladder. Ureters are smooth muscle structures, and urine is passed through each ureter by peristalsis. Drop by drop, urine passes into the bladder. Ureters are about 15 to 18 inches in length and about $\frac{1}{5}$ inch in diameter.

2-65. Urinary Bladder

The urinary bladder, a muscular sac located in the lowest part of the abdominal cavity, stores urine. Normally it holds 300 to 500 ml. The bladder is emptied by contraction of muscles in its walls which force urine out through the urethra.

2-66. Urethra

The urethra is the tube that carries urine from the urinary bladder to the external opening, the urinary meatus. In the male, the urethra will vary in length. Including the portion within the body, it is approximately 6 to $7\frac{1}{2}$ inches in length. It is divided into three areas: the prostatic which passes through the prostate gland; the membranous area, beneath the prostate; and the penile area (anterior), which passes through the penis (para 2-85). The female urethra, about $1\frac{1}{2}$ inch long, extends from the bladder to the meatus, which is located above the vaginal opening.

2-67. Urine

Normal urine is an aromatic, transparent (clear) fluid. The color of normal urine varies from amber or pale yellow to a brownish hue. Freshly voided urine has a characteristic aromatic odor, while stale urine has strong ammonia odor. The average quantity of urine excreted by a normal adult in 24 hours ranges from 1,500 to 2,000 ml., depending upon the fluid intake, amount of perspiration, and other factors. Urine contains protein wastes (urea), salts in solution, hormones, and pigments. (Normal urine should not contain blood, albumin, sugar, or pus cells.)

2-68. Urination

Urination is the discharge or voiding of urine. It is done by a contraction of the bladder and relaxation of the sphincters. In the adult, the act of voiding, although dependent on involuntary reflexes, is partly under voluntary control. Voluntary contraction of abdominal muscles usually accompanies and aids urination.

Section X. THE NERVOUS SYSTEM

2-69. General

a. The nervous system has two major functions, communication and control. It enables the individual to be aware of and to react to his environment. It coordinates the body's responses to stimuli and keeps body systems working together. (Stimuli are changes in environment that require adjustment of body activities.)

b. The nervous system consists of nerve centers and of nerves that branch off from them and lead to tissues and organs. Most nerve centers are in the brain and spinal cord. Nerves carry impulses from tissues and organs to nerve centers, and from these centers to tissues and organs. The neurons that carry impulses from the skin and other sense organs to the central nervous system are sensory neurons. They make the body aware of its environment. The neurons that carry impulses from the central nervous system to muscles and glands are motor neurons. They cause the body to react to its environment.

c. For study, parts of the nervous system may be considered separately as: the central nervous system, which consists of the brain and spinal cord; the peripheral nervous system, where the nerves are located outside the brain and spinal cord; and the autonomic nervous system, which influences the activities of involuntary muscle and gland tissue.

2-70. The Neuron and Nerves

a. The basic unit of the nervous system is the neuron, a cell specialized to respond to stimuli by transmitting impulses. Neurons differ in shape and function from all other body cells. Each neuron has three parts: a cell body and two kinds of processes extending from it (fig. 2-2 Ⓓ). Many branched processes, the dendrites, conduct impulses toward the cell body. A single process, the axon, conducts impulses away from the cell body. Impulses are the messages carried by the processes. All communication between nerve cells is carried out through these dendrites and axons at the region of contact (synapse) between processes of 2 adjacent neurons.

b. The neuron processes, whether dendrite or axon, are called fibers. These nerve fibers are wrapped in an insulating material, the myelin sheath. In addition to the myelin sheath, nerve fibers that extend outside the brain and spinal cord (peripheral nerves) have an outside wrapping called neurilemma. The neurilemma and the nerve cell body are essential for nerve regeneration following injury. In time, if the nerve cell body has not been destroyed, a peripheral nerve fiber can regenerate.

c. Nerve cells and nerve processes are bound together and supported by special connective tissue cells called neuroglia. Neuroglia literally means nerve glue. Several different kinds of neuroglia cells help form nerve tissue.

d. Nerves, which appear as whitish cords, are bundles of nerve fibers bound together by a connective tissue sheath.

2-71. The Central Nervous System

The central nervous system (CNS) consists of the brain and spinal cord. These are delicate structures that are protected by two coverings, bones and special membranes. The brain is encased by the bones of the skull that form the cranium; the spinal cord by the vertebrae. The membranes enclosing both brain and spinal cord are the meninges.

a. The Meninges. Three layers of protective membranes, the meninges, surround the brain and spinal cord. The outer layer of strong fibrous tissue is called the dura mater. The middle layer of delicate cobwebby tissue is the arachnoid. The innermost layer, adherent to the outer surface of the brain and spinal cord, is the pia mater. Between the dura mater and arachnoid is the subdural space; between the arachnoid and pia mater is the subarachnoid space.

b. Cerebrospinal Fluid. In addition to protective bones and membranes, nature provides a cushion of fluid around and within the subarachnoid space, in the spaces within the brain called the ventricles, and in the central canal of the spinal cord. Cerebrospinal fluid, which is similar to lymph, filters out from networks of capillaries in the ventricles. It is formed constantly, circulated constantly, and part of it is reabsorbed constantly into the venous blood of the brain. At any one time, an adult has about 135 ml. of this fluid circulating, although over 500 ml. is produced daily. If anything interferes with its circulation or its reabsorption, the fluid accumulates. An abnormal accumulation of cerebrospinal fluid is hydrocephalus (water on the brain).

c. The Brain. The brain (fig. 2-29), a mass of nervous tissue, is the highest level of the nervous system. It coordinates activities of the entire body; carries on the learning, thinking, and reasoning processes; and directs voluntary movements of the body. The brain may be divided into three parts: the cerebrum, cerebellum, and the brain-stem, the last consisting of the forebrain, midbrain, pons, and medulla. The midbrain serves as a connecting pathway between the right and left halves of the cerebrum and also between the cerebellum and the rest of the brain.

(1) *Cerebrum.* The cerebrum is described as resembling many small sausages bound together. It is the largest part of the brain, divided, not quite completely, into two hemispheres. Each hemisphere has five lobes. The outer surface, or cortex, of the brain is made up of gray matter, which is composed of nerve cells. The white matter within the brain is made up of nerve fibers, which lead to and from the cell bodies in the gray matter. Certain areas of the cerebrum are localized for certain functions, but it is believed that no one area functions independently. In the frontal lobe is the motor area, which controls voluntary movements, the speech center, and the writing center. In the parietal lobe is the general sensory area which perceives sensations of heat, cold, touch, pressure, pain, and position. In the temporal lobe are the centers for hearing and smelling. In the occipital lobe is the visual center.

(2) *Cerebellum.* The cerebellum lies below the posterior part of the cerebrum. It coordinates muscular activity at an unconscious level. It also

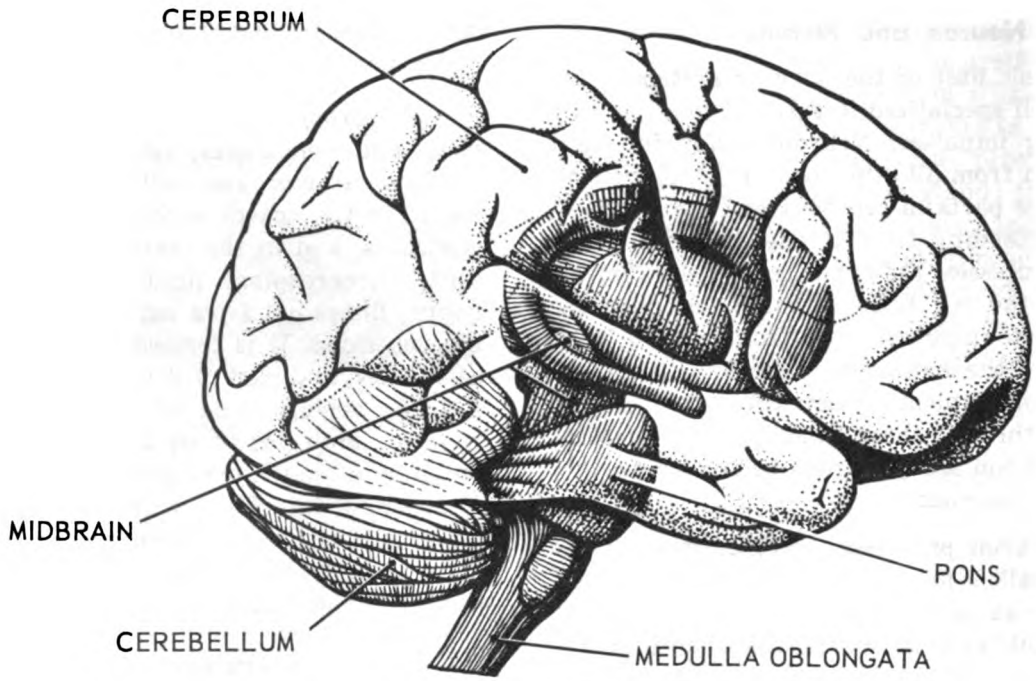


Figure 2–29. The brain, sagittal section.

coordinates with the cerebrum to produce skilled movements. The cerebellum helps control posture and controls skeletal muscles to maintain equilibrium. If the cerebellum is injured, movements will be jerky and trembly.

(3) *The pons.* The pons is a bridgelike structure, forming the part of the brain stem above the medulla. Nerve pathways between the spinal cord and other parts of the brain go through the pons.

(4) *The medulla.* The medulla oblongata, a bulblike structure attaching the brain to the spinal cord, is a part of the brain stem. It contains vital centers controlling heart action, blood vessel diameter, and respirations. Mechanisms controlling nonvital functions such as sneezing, hiccoughing, and vomiting are also functions of the medulla. Nerve fibers cross from one side to the other in the medulla, a fact that explains why one side of the brain is said to control the opposite side of the body.

d. The Spinal Cord. The spinal cord, protected by meninges and vertebrae, is about 18 inches in length. The cord is continuous with the medulla of the brain and terminates at a level between the first and second lumbar vertebrae (fig. 2–9).

(1) The meninges inclosing the cord continue down below the termination of the cord and are anchored at the sacrum and coccyx. This anatomical feature makes it possible for a physician to withdraw samples of cerebrospinal fluid without danger of injuring the cord. When a patient is placed on his side and his back is arched by drawing his knees and chest together, the space between the fourth and fifth lumbar vertebrae is enlarged. A lumbar puncture needle can be inserted through the intervertebral space into the subarachnoid space to obtain spinal fluid for diagnostic tests. This feature also makes it possible to administer spinal anesthesia.

(2) The spinal cord has two major functions —conduction and connection. Many nerves enter and leave the spinal cord at different levels. These nerves all connect with nerve centers located within the spinal cord or with nerve centers in the brain. Nerve centers within the cord form the gray matter of the cord's inner core. Surrounding the gray matter are columns of nerve fibers, forming the white matter. The nerve fiber columns in the spinal cord are called tracts; these tracts connect the different levels of the nervous system. Tracts which transmit upward, the ascending tracts, are all sensory nerve fibers. Tracts which transmit impulses downward, the descending tracts, are all motor nerve fibers, controlling both voluntary and involuntary muscles. When the spinal cord is damaged, the extent of disability depends upon which nerve centers and which tracts are damaged.

(3) The soft spinal cord can be compressed by vertebrae fractures or by dislocation and displacement of vertebrae or vertebrae discs. If the

pressure can be relieved by surgical procedures or by traction, permanent damage may be avoided. Careful and knowledgeable moving and transporting of all patients suspected of having a spinal injury is essential to minimize injury to the spinal cord. If the cord is severed, or if all cord tracts have been damaged, patients lose feeling because sensory impulses cannot reach the brain; they are paralyzed, because motor impulses from the brain can no longer reach muscles located below the injury. Damage to the cord in the cervical area is particularly disabling because all of the cord tracts below the injury are involved. Disease, injury, or chemicals (drugs) can cause loss of function by interrupting the conduction and connection pathways.

(4) All sensory impulses coming into the cord do not have to travel all the way to the brain to get a motor impulse reaction. The gray matter in the spinal cord contains reflex centers, the places where incoming sensory impulses become outgoing motor impulses. There are reflex centers in both the brain and the spinal cord. The knee jerk is an example of a spinal cord reflex. When the doctor taps the patellar tendon, the sensation is transmitted to a segment of the spinal cord at the lumbar level, and a motor impulse causes extension of the lower leg. This kind of reflex is an involuntary response. If lumbar segments of the cord are damaged, the knee jerk is absent. The doctor tests for these different reflexes during a neurological examination because in certain diseases they deviate from normal.

2-72. The Peripheral Nervous System

The peripheral nervous system is composed of the nerves located outside the brain and spinal cord. Cranial nerves and their branches stem from the brain; spinal nerves and their branches stem from the spinal cord.

a. The Cranial Nerves. The 12 pairs of cranial nerves arise from the undersurface of the brain and pass through openings in the skull to their destinations (table 2-3). The nerves are numbered and have names that describe their distribution or their function; *for example,* the vagus nerve (fig. 2-30), the cranial nerve, is an important nerve in the autonomic nervous system, with both sensory and motor fibers distributed to organs in the thorax and abdomen. The cranial nerves supply organs of special sense, such as the eye, nose, ears, tongue, and their associated muscles, and also control muscles of the face, neck, thorax, and abdomen.

NOTE

Cranial nerves are usually indicated by Roman numerals.

b. The Spinal Nerves. The 31 pairs of spinal nerves arise from the spinal cord and pass through lateral openings between the vertebrae. Spinal nerves are numbered according to the level of the spinal column at which they emerge. The lumbar, sacral, and coccygeal nerves descend from the terminal end of the spinal cord and emerge in sequence from their respective vertebrae. These lower spinal nerves form the cauda equina (horse's tail) within the spinal cavity. Spinal nerves branch and subdivide into many lesser nerves after emerging from the spinal cavity.

(1) *Nerve plexuses.* A nerve plexus is a network of spinal nerve subdivisions that appear as tangled masses in areas outside the spinal cord. The brachial plexus (fig. 2-30) is in the shoulder region. Nerves emerging from this tangle go to the skin, the arm, and the hand. Pressure and/or

Table 2-3. The 12 Cranial Nerves

Number and name	Origin	Associated with—
I. Olfactory (sensory)	Nasal chamber	Sense of smell
II. Optic (sensory)	Retina	Sense of sight
III. Oculomotor (motor)	Midbrain	Eyeball muscles
IV. Trochlear (motor)	Midbrain	Eyeball muscles
V. Trigeminal (sensory and mixed).	Pons	(Three branches) eye, upper portion of face, ear, lower lip, teeth, gums.
VI. Abducens (motor)	Pons	Eyeball muscles
VII. Facial (mixed)	Pons	Facial muscles, middle ear, taste
VIII. Auditory (sensory)	Pons	Sense of hearing and balance
XI. Glossopharyngeal (mixed)	Medulla	Taste, swallowing
X. Vagus (mixed)	Medulla	Swallowing, hunger, speech muscles, breathing, heart rate, peristalsis, control of glands in stomach and pancreas.
XI. Spinal accessory (motor)	Medulla	Muscles of neck and upper back.
XII. Hypoglossal (motor)	Medulla	Muscles of tongue

stretching of the brachial plexus can cause paralysis of the arm and hand. If an unconscious patient's arm is allowed to dangle off a litter or bed, the plexus can be overstretched. Pressure from a plaster cast can also damage this area. The sacral plexus in the pelvic cavity supplies nerves to the lower extremity. The largest nerve in the body, the sciatic nerve, emerges from the sacral plexus. From the buttocks, the sciatic nerve runs down the back of the thigh; its branches supply posterior thigh muscles, leg, and foot. The sciatic nerve must be avoided when intramuscular injections are given into the buttocks.

(2) *Nerve fibers.* All spinal nerves carry both sensory and motor fibers. Some of the fibers supply skeletal muscle and others supply visceral (smooth) muscle. The spinal nerves are two-way conductors, and if anything happens to them, there can be both anesthesia, loss of sensation, and paralysis, loss of motion.

2–73. The Autonomic Nervous System

The autonomic nervous system is part of the nervous system that sends nerve fibers from nerve centers to smooth muscle, cardiac muscle, and gland tissue. Autonomic nerve fibers supply nerve impulses to body structures that are thought of as operating outside conscious control. Organs supplied are the heart, blood vessels, iris and ciliary muscles of the eye, bronchial tubes, parts of the esophagus, and abdominal organs. The autonomic nervous system is a part of the central and peripheral nervous system. It is not separate and independent. It has two divisions, sympathetic and parasympathetic. These divisions receive impulses from the CNS by way of the ganglia.

a. Ganglia are the relay stations of the autonomic nervous system. Neurons originating in the cord, or in the brain, conduct impulses to an autonomic ganglion. Other neurons conduct impulses from the ganglion to the tissue or organ. Ganglia of the sympathetic division are in a chain formation, like a string of beads, one on each side of the spinal column. Ganglia of the parasympathetic division are located in or near the organs to which they send impulses (table 2–4).

b. The sympathetic division regulates activities to prepare the body for maximum effort as a response to hazardous conditions. Sympathetic stimulation and response to stress go together.

c. The parasympathetic division regulates activities to conserve energy and to promote digestion and elimination.

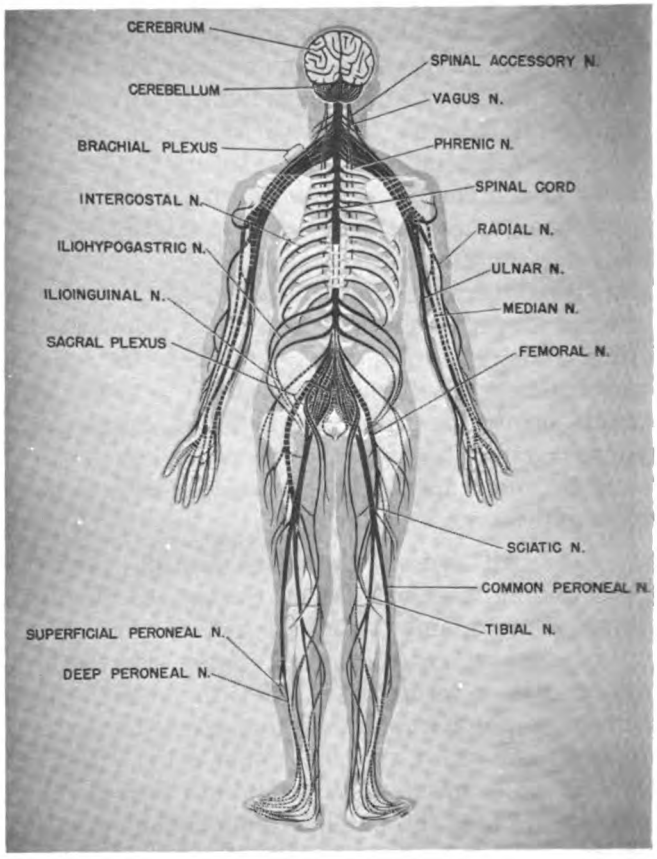


Figure 2–30. Principal nerve trunks.

2–74. Special Senses

Sensations of smell, taste, sight, hearing, and equilibrium are usually referred to as special senses because these sensations are received through specialized sense organs or receptors which are sensitive to specific types of stimuli. Other very important sensations such as touch, pressure, pain, heat, and cold are received through receptors widely distributed in the skin and underlying tissue and in viscera. Impulses from receptors for both special and other senses are carried by sensory nerve pathways to the cerebrum. There the impulses are converted into sensation and perception (awareness or consciousness of sensation). The parts of the sensory mechanism are (1) the sense organ or receptor, (2) the pathway by which the impulse is conducted into the central nervous system, and (3) the sensory center in the cerebrum. The sensory mechanisms of the special senses are summarized as follows:

a. Smell. Cells located in the olfactory membrane of the nose are stimulated by odors. The olfactory membrane is located in the uppermost part of the nose, in the area above the upper turbinates. Impulses from receptors for odors are

Table 2-4. Functions of the Autonomic Nervous System

Increased sympathetic tone results in—	Increased parasympathetic tone results in—
1. Dilation of pupils.	1. Contraction of pupils.
2. Decreased tones of ciliary muscles, so that the eyes are accommodated to see distant objects.	2. Contraction of ciliary muscles, so that the eyes are accommodated to see objects near at hand.
3. Dilation of bronchial tubes.	3. Contraction of bronchial tubes.
4. Quickened and strengthened heart action.	4. Slowed heart action.
5. Contraction of blood vessels of the skin and viscera so that more blood goes to the muscles where it is needed for "fight or flight."	5. Dilation of blood vessels.
6. Relaxation of gastrointestinal tract and bladder.	6. Increased contractions of gastrointestinal tract and muscle tone of bladder.
7. Decreased secretions of glands (except sweat glands which secrete more).	7. Increased secretions of glands (except sweat glands).
8. Contraction of sphincters which prevents emptying of bowels and bladder.	8. Relaxation of sphincters which allows emptying of bowels or bladder.

transmitted by the olfactory nerve to the temporal lobe of the brain. Although olfactory receptor cells are quite sensitive, they can also become fatigued, and odors that at first may be very noticeable may be less so upon continued exposure. Smell is considered a primitive sense and the detection of odors is more highly developed in animals than in man.

b. Taste. Sense organs for taste are taste buds located in the surface of the tongue. The primary taste sensations are sweet, sour, salty and bitter. The actual sensation of taste, particularly for distinctive flavors, is influenced by the sense of smell. Taste sensation is usually dulled when nasal membranes are congested or when the nostrils are pinched shut while eating foods. Impulses from taste receptors are transmitted by nerve fibers from two cranial nerves, facial and glossopharyngeal, to the temporal lobe.

c. Sight. Cells in the retina of the eye (fig. 2–3 Ⓐ) are stimulated by light rays entering the eye. These stimuli create impulses that are carried by the optic nerve to the visual center of the occipital lobe of the brain.

d. Hearing. Cells in the cochlea of the inner ear (fig. 2–32 Ⓑ) are stimulated by vibration of sound waves. These stimuli create impulses that are carried by the cochlear branch of the acoustic (auditory) nerve to the auditory center of the temporal lobe.

e. Equilibrium. In addition to receptors for hearing, the internal ear contains three semicircular canals which regulate the sense of equilibrium. Change in position of the head causes movement of fluid within the canals. The fluid movement stimulates nerve endings in the walls of the canals which send impulses to the brain by the vestibular branch of the auditory nerve.

2–75. The Eye

The eye is specialized for the reception of light. Each eye is located in a bony socket or cavity called the orbit, which is formed by several bones in the skull. The orbit provides protection, support, and attachment for the eye and its muscles, nerves, and blood vessels.

a. The Eyeball. The interior of the eye (fig. 2–31 Ⓐ) is divided into an anterior cavity (anterior to the lens) and a posterior cavity (posterior to the lens). A clear watery solution, the aqueous fluid, is formed and circulated in the anterior cavity. A transparent, semifluid material, the vitreous fluid, is contained in the posterior cavity. The globular form and firmness of the eyeball is maintained by its fluid contents, which also function in the transmission of light.

(1) *Eye tissue coats.* The eyeball has an outer coat, a middle coat, and an inner coat.

(*a*) *Outer coat.* The outer coat consists of a normally invisible, transparent anterior portion, the cornea, and a fibrous, white, nontransparent portion, the sclera, which is directly continuous with the cornea. The transparent cornea focuses and transmits light to the interior of the eye. The surface of the cornea must be moist at all times to maintain its transparency. The sclera helps to maintain the shape of the eyeball and protects the delicate structures within.

(*b*) *Middle coat.* The middle coat consists of the choroid, the iris, and the ciliary body. These three structures are referred to as the uveal tract. The choroid, the vascular middle layer of the eyeball, lies beneath the sclera and lines the posterior portion of the eye from the ciliary body to the optic nerve. The iris is a circular, colored, muscular membrane which is suspended between

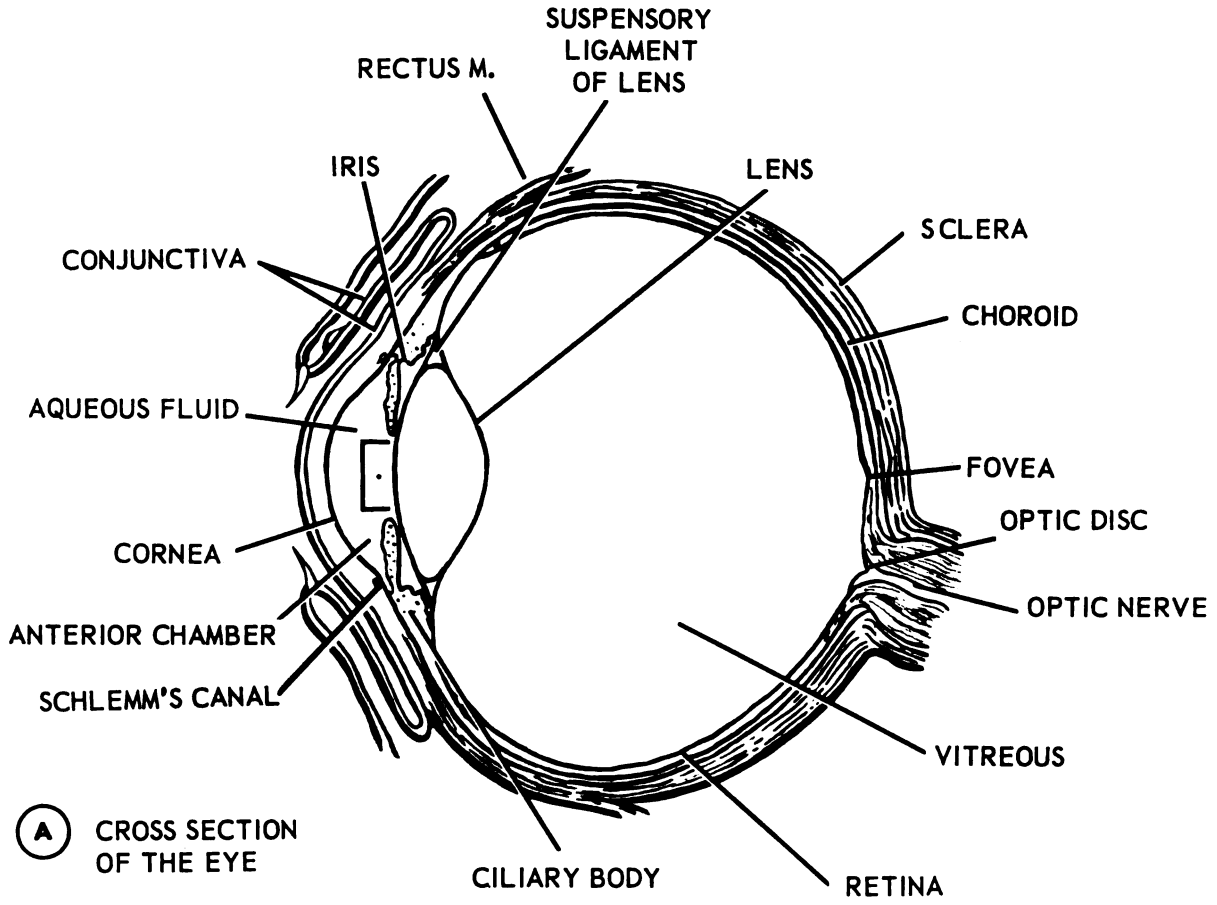


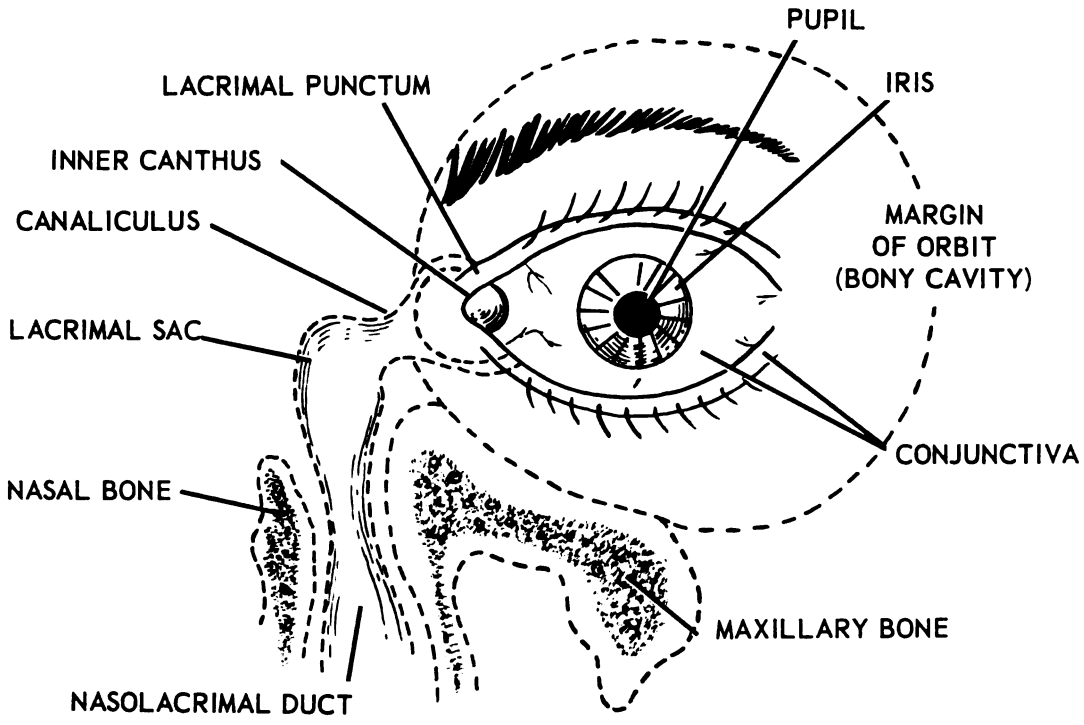
Figure 2-31. The eye.

the cornea and the lens. The pigment material in the iris gives the eye its characteristic color. The round opening in its center is the pupil. The muscle structure of the iris adjusts the size of the pupil to adapt the eye to existing brightness of light. The ciliary body lies between the iris and choroid; it has a muscular function, changing the focus of the lens, and a secretory function, producing aqueous fluid.

(*c*) *Inner coat.* The inner coat is the retina, which lines the interior of the eye except toward its anterior inner surface. The visual nerve cells (rods and cones) are arranged closest together at the central portion of the retina, the macula lutea. A slight depression in the macula lutea, the fovea centralis, is in a direct line back from the center of the cornea and lens and is the area of the retina most sensitive to light. Medial to the fovea centralis is the area called the optic disc, the site of exit of the optic nerve and entry of the retinal artery. Here there is a natural defect in the retina; there are no visual cells at the exit of the optic nerve and in every eye there is, therefore, a physiological "blind spot." When the doctor examines the interior of the eye with an ophthalmoscope, he can see the posterior surface of the retina and examine the appearance of the optic disc. The inner surface of the retina is in contact with the vitreous and the outer surface with the choroid. The condition known as "detached retina" means that some portion of the retina has become separated from the supporting choroid.

(2) *The lens.* The lens is a small, disc-shaped, transparent structure about ⅓ inch in diameter. It is situated immediately behind the iris and in front of the vitreous cavity. The lens is suspended in a capsule within the globe of the eye by a circular ligament, the suspensory ligament of the lens. This ligament is attached to the ciliary body. Muscular movements of the ciliary body affect the suspensory ligament and the consequent focus of the lens. The condition of "cataract" means that some portion of the lens has lost its transparency and has become cloudy or opaque.

(3) *Aqueous fluid.* The aqueous fluid is formed by a portion of the ciliary body and fills the two divisions of the anterior cavity of the eye, called the anterior and the posterior chamber.



Ⓑ THE EYE (FRONTAL, EXTERIOR VIEW) AND LACRIMAL APPARATUS.

Figure 2–31—Continued.

Aqueous fluid is normally crystal clear for transmission of light rays and its formation and flow helps maintain the normal intraocular pressure. The aqueous fluid flows from the posterior chamber to the anterior chamber and drains by means of a series of channels into the venous blood. The largest of these drainage channels is the canal of Schlemm. Interference with the normal formation and flow of aqueous fluid can lead to development of excessively high intraocular pressure, a condition called glaucoma. Glaucoma will cause blindness. Fortunately, glaucoma can be detected by a tonometry examination, the measurement of internal eye pressure by means of a measuring instrument, a tonometer. With early detection, glaucoma can be treated successfully and blindness can be prevented.

b. The External Eye and Accessory Structures. Viewed from the surface of the body, the anterior surface of the eye and some of its accessory structures such as eyebrows, lids, lashes, and conjunctiva are readily visible. An additional essential accessory structure, the lacrimal (tear) apparatus, is indicated in figure 2–31 Ⓑ.

(1) *Eyebrows and eyelashes.* The eyebrow and lashes are usually considered to have a cosmetic (decorative) function, but the eyelashes also help protect against the entrance of foreign objects into the eyes. An eyelash becomes a foreign body itself if it becomes detached and falls on the eye surface. On the margin of the eyelids near the attachment of the eyelashes are the openings of a number of glands. Infection in these glands is commonly called a sty.

(2) *Eyelids.* The eyelids are thin, moveable, protective coverings for the eyes. The junctions of the upper and lower eyelids of each eye are canthi; the inner canthus (fig. 2–31 Ⓑ) is at the nasal junction and the outer canthus is at the temporal junction. A sheet of connective tissue called the tarsal plate maintains the shape of the eyelids. The tarsal plate and the orbicularis oculi muscle hold the eyelids in proper position against the eye; a levator (lifting) muscle opens the upper lid by pulling the lid upward into the orbit. The circular orbicularis oculi muscle closes the eyelids.

(3) *Conjunctiva.* The conjunctiva (fig. 2–31 Ⓑ) is a delicate mucous membrane which lines the inside of the eyelids and covers the front surface of the eyeball, continuing over the cornea as the corneal epithelium. The edge or margin where the conjunctiva overlaps the cornea is called the limbus; it is sometimes visible at the periphery of

the iris. The semitransparent conjunctiva appears while on the front surface of the eyeball where it covers the sclera and pink where it overlies lid tissue. Should the conjunctiva itself become inflamed or infected it appears red and swollen; one type of acute bacterial infection of the conjunctiva is commonly called "pinkeye."

(4) *The lacrimal apparatus.* The lacrimal apparatus consists of the lacrimal gland, lacrimal ducts (canaliculi), lacrimal sac, and the nasolacrimal duct (fig. 2-31 Ⓑ). Its function is the secretion and drainage of tears. The lacrimal gland (not illustrated) is about the shape and size of a small almond and is located in a small depression on the lateral side of the frontal bone of the orbit. Many small ducts drain tears secreted by the gland to the conjunctival surface; the tears drain downward and toward the inner angle of the eye. The normal regular blinking of the eyelids helps to spread the tears evenly to provide a lubricating, protective, moist film over the exposed surface of the cornea. The tears drain into openings near the nasal portion of each eyelid (lacrimal puncti) and then into the tear ducts, the sac, and finally into the nose through the nasolacrimal duct. This normal formation and drainage of tears is the natural way in which the eye surface is kept clean and moist.

(5) *Extraocular muscles.* In addition to the levator muscles of the eyelids and the orbicularis oculi, there are six sets of muscles located outside the eyeball. These muscles raise, lower, or rotate the eyeball within its socket. The muscles of the two eyes normally function in a coordinated manner so that both eyes move simultaneously and are aimed in the same direction. Divergence or crossing of the eyes is called strabismus.

2-76. The Ear

The ear, the organ of hearing, consists of three parts; the external ear, the middle ear (tympanic cavity), and the internal ear (the labyrinth). These divisions are commonly referred to as the outer ear, the middle ear, and the inner ear. They provide the reception and conduction of sound and contain one of the principal mechanisms for the maintenance of equilibrium. The structures of the ear, except the part protruding from the head, are situated within portions of the temporal bone of the skull.

a. The external ear (fig. 2-32 Ⓐ) consists of the shell-shaped portion of the ear, called the auricle or pinna, which projects from the side of the head and of the external acoustic meatus, which is the external auditory canal leading inward toward the middle ear. The principal function of the external ear is the collection and conduction of sound waves to the middle and the inner ear. The auricle or pinna is composed of cartilage covered with membrane (called the perichondrium) and the skin.

(1) The prominent folded rim of the ear is the helix.

(2) A deep cavity, the concha, leads into the external auditory canal.

(3) In front of the concha and projecting backward over the entrance to the external auditory canal is a small, triangular eminence of cartilage called the tragus. The tragus protects, but does not touch, the entrance to the external auditory canal. The undersurface of the tragus is usually covered with soft hairs which help to prevent insects and other foreign bodies from entering the ear.

(4) The lobule, or lobe, is located inferior to the tragus and to the lowest point of the helix. The lobule contains no cartilage, is composed of adipose (fatty) tissue and of connective tissue, and lacks the firmness of the rest of the auricle.

b. The external auditory canal extends about 1¼ inches from its entrance at the bottom of the concha to the tympanic membrane, or eardrum, which closes its inner end. The canal is formed of two parts, its outer, or cartilaginous, part which is formed of cartilage and membrane; and its inner, or bony portion, formed by a passage in the temporal bone. The cartilage of the auricle is continuous with that forming the outer portion of the canal.

(1) Two or more deep fissures are present in

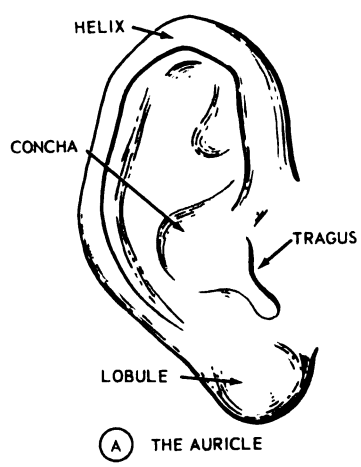
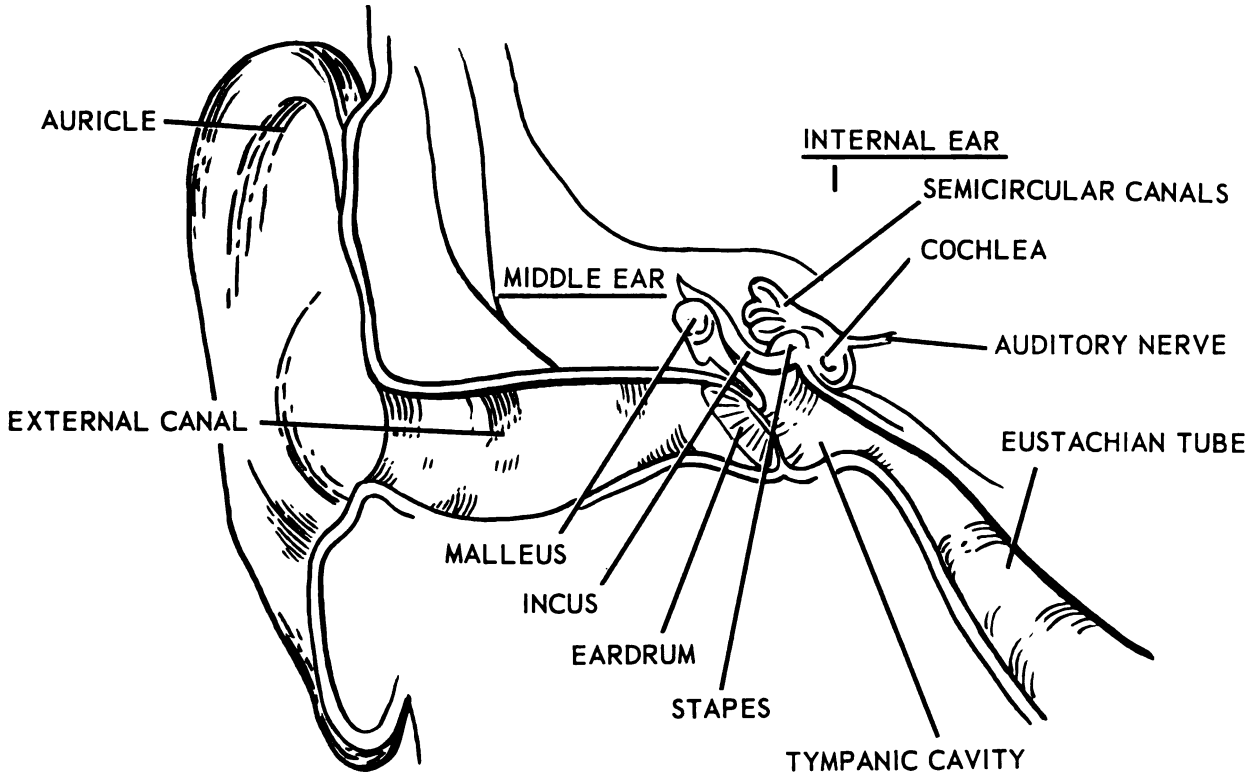


Figure 2-32. The ear.



B THE EXTERNAL, MIDDLE, AND INTERNAL EAR, FRONTAL VIEW

Figure 2-32—Continued

the anterior wall of the cartilaginous portion of the canal and are filled with fibrous membrane which allows for the flexibility of the canal. If the auricle (helix area) is pulled up and back, this portion of the canal straightens and may be examined or treated more easily. The entire passage is lined with skin. Near the entrance of the canal, the skin contains wax-producing glands and hair follicles. This wax, called cerumen, also helps to prevent the entry of foreign objects into the ear.

(2) The tympanic membrane, or eardrum, separates the inner end of the canal from the middle ear. The medical officer examines the external canal and the eardrum by means of a lighted instrument, an otoscope. The normal eardrum is translucent (partly transparent) and shiny gray (pearl-like). When inflamed, it appears pink or dull red.

c. The middle ear (tympanic cavity) is an irregular space in the temporal bone filled with air and containing the three ossicles of the ear: malleus (hammer), incus (anvil), and stapes (stirrup). These bones conduct vibrations from the eardrum to the internal ear.

(1) The eustachian tube which connects the middle ear with the nasopharynx is about 1½ inches long. The trumpet-shaped opening of the eustachian tube into the pharynx remains closed except during the act of yawning or of swallowing, when it opens to admit air into the middle ear, thus performing its principal function of keeping the air pressure equal on either side of the eardrum. This is also an avenue of infection by which disease spreads from the throat to the middle ear.

(2) The roof or superior wall of the middle ear is composed of a very thin plate of bone which separates it from the dura. This bony plate is quite susceptible to fracture in head trauma and to spread of infection from the middle ear (otitis media), either of which can result in intracranial disease.

d. Internal ear (labyrinth). The internal ear contains receptors for hearing and equilibrium.

The receptor for hearing, the organ of Corti, lies within a structure called the cochlea which is coiled and resembles the shell of a snail.

(1) Sound waves, which pass through the external auditory canal, vibrate the eardrum and ossicles and are finally transmitted through the fluid of the inner ear. Nerve impulses travel through the acoustic (auditory) nerve from the organ of Corti to the auditory center of the cerebral cortex. The acoustic nerve is the final link in the chain of mechanisms which convey the sensation of sound to the brain for perception.

(2) The internal ear also contains three semicircular canals which control equilibrium. Change in the position of the head causes movement of the fluid within the canals and this fluid movement stimulates nerve endings in the wall of the canal. These nerve endings serve as receptors and transmit impulses along the acoustic nerve to the cerebellum.

Section XI. THE ENDOCRINE SYSTEM

2-77. Components

The endocrine system is made up of glands classified as glands of internal secretion (ductless glands). These glands are located in different parts of the body (fig. 2-33). Secretions produced by endocrine glands are hormones, which are secreted directly into the circulating blood, reach every part of the body, and influence the activities of specific organs and tissues, as well as the activities of the body as a whole. Small in quantity but powerful in action, hormones are part of the body's chemical coordinating and regulating system. There are six recognized endocrine glands—the thyroid, parathyroid, adrenals, pituitary (hypophysis), the testes or ovaries (male or female gonads, the glands of sex), and the pancreas.

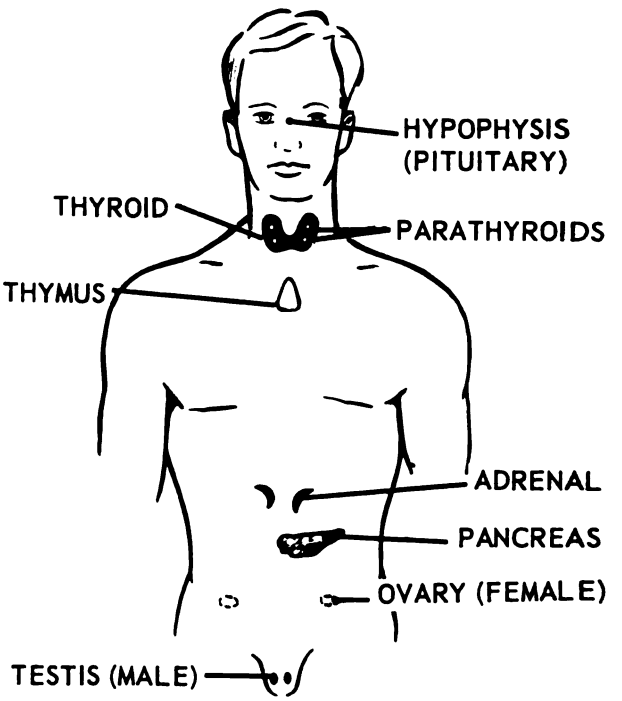


Figure 2-33. Endocrine system.

2-78. The Thyroid

The thyroid gland, located in front of the neck, has two lobes, one on either side of the larynx. The hormone produced by the thyroid is thyroxin. This hormone is associated with metabolism, regulating heat and energy production in body cells. Thyroid gland cells need a mineral, iodine, to manufacture thyroxin. Iodine is ordinarily obtained from foods included in normal diet; however, certain geographical areas have an iodine deficiency. In these areas, iodized table salt can be used to insure an adequate amount of iodine for normal thyroid function. (This use of iodized salt is an example of a preventive health measure.) Disorders of thyroid function include hyperthyroidism, which, when severe, causes a dangerous increase in the metabolic rate; and hypothyroidism, an opposite condition, which causes physical and mental sluggishness. An enlargement of the thyroid gland is called a goiter. When the enlargement is a nodular tumor, it is called an adenoma. During a physical examination, the doctor may palpate the neck tissues to determine the size and consistency of thyroid tissue.

2-79. The Parathyroids

The parathyroid glands, usually four in number, are located on the posterior surfaces of the lobes of the thyroid gland. These glands produce the hormone, parathormone, which helps to regulate the amount of calcium in the blood. Calcium, normally stored in the bones, is released into the blood as required for normal nerve and muscle tissue function. When there is too little calcium in the blood, a type of muscle twitching called tetany develops. Because of the location of the parathyroid glands in relation to the thyroid, special ob-

servation for tetany may be required in the immediate postoperative period following thyroid surgery. Calcium is given by intravenous infusion to relieve the symptoms of tetany.

2–80. The Adrenal Glands

The two adrenal glands are located one above each kidney (suprarenal glands). Each adrenal gland actually functions as two separate glands, producing different hormones from its two parts, the medulla and the cortex. The medulla is the inner part of the adrenal gland. It produces epinephrine, the "fight or flight" hormone. The medulla is stimulated to produce epinephrine by the sympathetic branch of the autonomic nervous system in order to give the body the extra push it needs in responding to emergencies. The cortex, the outer part of the adrenal glands, produces a series of adrenocortical hormones, which include hydrocortisone. The adrenocortical hormones influence the salt and water balance of the body, the metabolism of foods, and the ability of the body to handle stress. The cortex of the adrenal glands requires stimulation by a hormone produced by the pituitary gland.

2–81. The Pituitary Gland

The pituitary gland, located deep within the skull, is also called the hypophysis. This small gland has two lobes, each producing distinctive hormones. The anterior lobe hormones stimulate other endocrine glands to produce their distinctive secretions; for this reason, the pituitary gland is called the master gland of the endocrine system. The four hormones produced by the anterior lobe of the pituitary have names with the suffix "trophic," meaning nourishing. Somatotrophic hormone (STH) means body nourishing. This hormone influences skeletal and soft tissue growth. Adrenocorticotrophic hormone (ACTH) stimulates the cortex of the adrenal gland to produce its cortisone-type hormones. Gonadotrophic hormone stimulates the normal development of the gonads, the testes or ovaries, and controls the development of the male and female reproductive systems. Thyrotrophic hormone stimulates the thyroid gland to produce its hormone. The posterior lobe of the pituitary gland produces a hormone that stimulates the contraction of the smooth muscle of the uterus, so it is important in childbirth. Another posterior lobe hormone which helps prevent excessive water excretion from the kidneys is called the antidiuretic hormone.

2–82. The Testes and Ovaries (the Gonads)

The male testes are located in the scrotum; the female ovaries, in the lower abdominal cavity. Hormones produced by these glands stimulate the development of sexual characteristics that normally appear at the development period called puberty (sexual maturity). They are responsible for the appearance of the secondary sexual characteristics: the pubic and axillary hair, the beard and the changing of the voice, and mammary (breast) development in the female. These hormones also help maintain the reproductive system organs in their adult state.

2–83. The Pancreas

Part of the pancreas functions as an accessory organ of the digestive system and part functions as an endocrine gland. Its endocrine gland function is carried out by groups of pancreas cells called the islands of Langerhans, which produce the hormone insulin. This hormone is necessary for the normal use of sugar by body cells. If insulin is not produced in sufficient amounts, the sugar normally present in the blood cannot be properly used by body cells, and the disease, diabetes mellitus, develops. A patient with diabetes mellitus requires continuous medical treatment—a combination of diet modification, education in modified living habits, and special medication as needed. As a medication, insulin must be given by hypodermic injection, because it is destroyed by digestive juices when taken by mouth. However, some patients requiring medication for diabetes mellitus can be treated with oral medications which are NOT insulin but which apparently stimulate underfunctioning pancreatic cells to produce insulin. An example of such a medication is tolbutamide (orinase). Other types of oral medication (such as phenformin) for diabetes promote the utilization of glucose by muscle tissue instead of stimulating underfunctioning pancreatic cells.

Section XII. THE REPRODUCTIVE SYSTEM

2-84. General

The male and female reproductive systems have their own specialized internal and external organs, passageways, and supportive structures. The parts and functions of these systems are designed to make the process of fertilization possible. The female cell, the ovum, must be fertilized by the male cell, the spermatozoa. The normal result of fertilization is reproduction. (Pregnancy and childbirth will be discussed in chapter 7.)

2-85. The Male Reproductive System

The major parts of the male reproductive system (fig. 2-34) are the scrotum, testis, epididymis, ductus deferens (also referred to as vas deferens or seminal duct), seminal vesicles, ejaculatory ducts, prostate gland, urethra, and penis. The penis, testes, and scrotum are referred to as external genitalia.

a. The Scrotum, the Testes, and the Epididymis. There are two testes, one on each side of the septum of the scrotum. A testis is an oval-shaped gland, about 1½ to 2 inches in length, which produces the male germ cells, spermatozoa (or sperm), and the male hormone, testosterone. Sperm are produced in great numbers, starting at the age of puberty. Although microscopic in size, each sperm has a head, which contains the cell nucleus, and an elongated tail for movement.

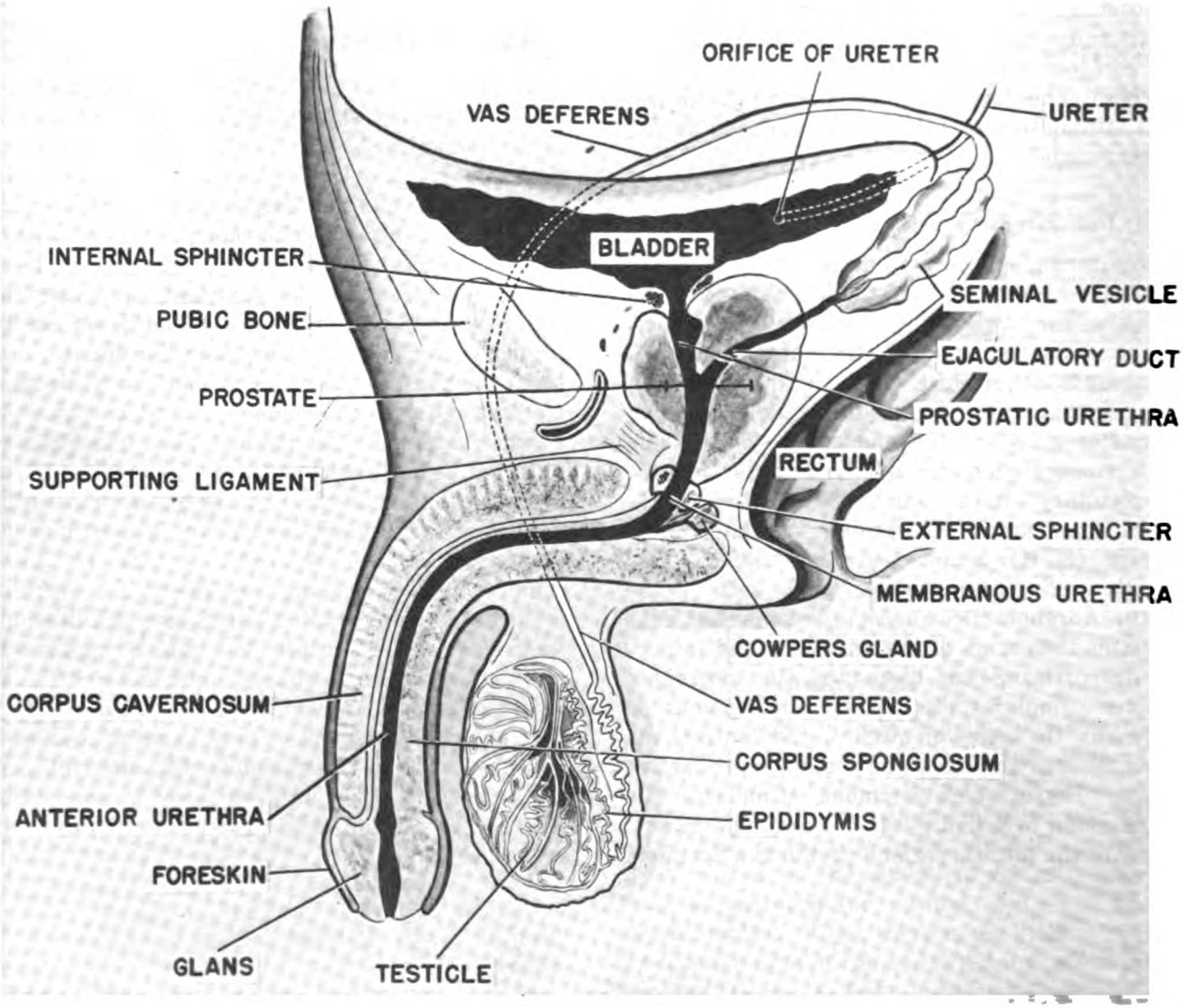


Figure 2-34. Male urogenital system.

Sperm travels from the testis to the tightly coiled tube, the epididymis. A continuation of the epididymis is the ductus deferens (or vas deferens) (fig. 2–35).

b. The Ductus Deferens. This duct carries sperm from the scrotum to the pelvic cavity. As the duct leaves the scrotum, it passes through the inguinal canal into the pelvic cavity as part of the spermatic cord. Spermatic cords, one in each groin, are supporting structures. Each ductus deferens curves around the bladder and delivers the sperm to one of two storage pouches, called the seminal vesicles.

c. The Seminal Vesicles and Ejaculatory Ducts. The seminal vesicles are located behind the bladder. During the storage of sperm in these vesicles, secretions are added to them to keep them alive and motile. The secretions and the sperm form the seminal fluid, or semen. Ejaculatory ducts carry the seminal fluid from the seminal vesicles, through the prostate gland, to the urethra.

d. The Prostate Gland. This gland is located around the urethra at the neck of the bladder (fig. 2–35). Prostatic secretions are added to the seminal fluid to protect it from urethral secretions and female vaginal secretions. When the prostate gland becomes enlarged (hypertrophied), it can seriously constrict the urethra. The size and consistency of the prostate gland is determined by the doctor by means of a rectal examination.

e. The Urethra and the Penis. The urethra, a passageway for seminal fluid and for urine, has its longest segment in the penis. Several glands add secretions to the urethra, the largest being two bulbo-urethral (or Cowper's) glands (fig. 2–35). The terminal opening of the urethra is in the glans penis, which is surrounded by a retractable fold of skin called the foreskin, or prepuce. Surgical removal of the foreskin is circumcision, which is performed to reduce the possibility of an abnormal constriction of the glans, called phimosis, or to reduce the possibility of irritation from secretions that accumulate under the foreskin. The penis has spongy tissues which become distended from a greatly increased blood supply during penile erection.

2–86. The Female Reproductive System

The major parts of the female reproductive system (fig. 2–36) are the ovaries; fallopian tubes; uterus; vagina; and the external genitalia, the vulva. The supportive structures for the internal reproductive organs are a complicated arrangement of pelvic ligaments, which are formed in part, from folds of peritoneum that line the abdomino-pelvic cavity.

a. The Ovaries. These are described as two almond-shaped glands (fig. 2–37), one on either side of the abdomino-pelvic cavity. They produce female germ cells, ova, and female hormones, estrogen and progesterone. These hormones maintain

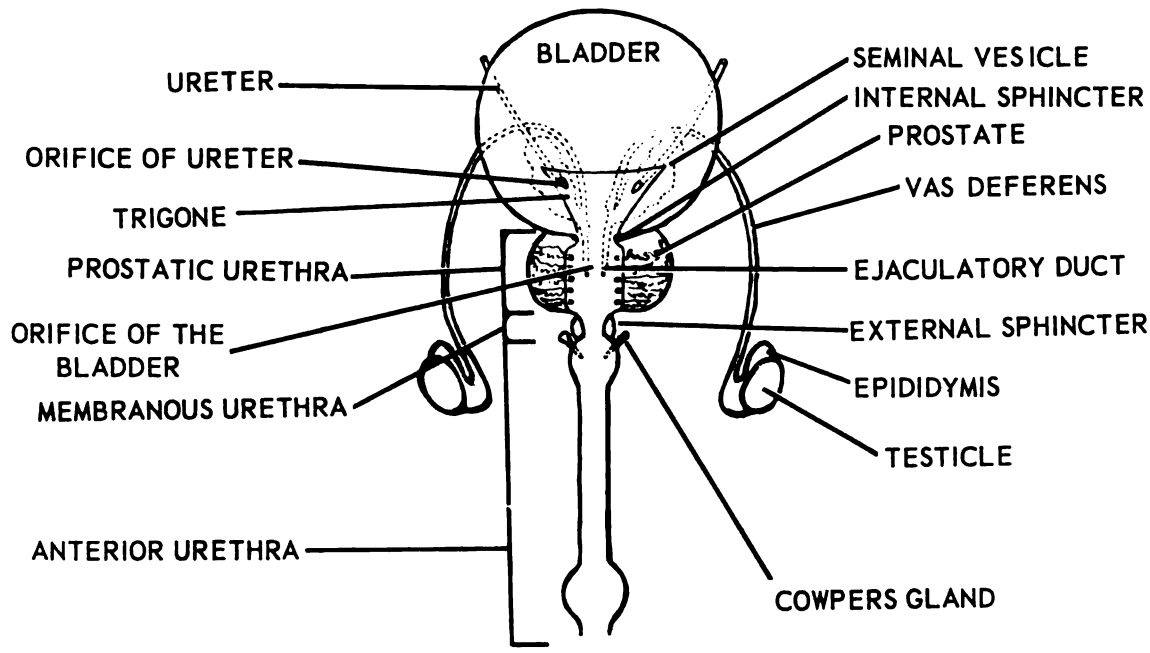


Figure 2–35. Diagram of male reproductive system.

the normal menstrual cycle An ovum is expelled from the surface of an ovary in a process called ovulation, which occurs about halfway between each menstrual period. An expelled ovum is picked up by the free end of a fallopian tube for transportation to the uterus.

b. Fallopian Tubes. There are two fallopian tubes (oviducts) each curving outward from the upper part of the uterus. About four inches in length, each tube has a free end which curves around, but is not attached to, an ovary. The fringed surface of the free end of the fallopian tube carries an expelled ovum into the tube, and the ovum moves slowly on its way to the uterus. If fertilization takes place, it normally occurs as the ovum moves through a tube. The male germ cell, the sperm, must therefore travel up the female reproductive tract in order to unite with the female germ cell, the ovum. Of the millions of sperm produced, only one must unite with one ovum for fertilization to occur.

c. The Uterus. The uterus, shaped somewhat like a pear, is suspended in the pelvic cavity, supported between the bladder and the rectum by its system of eight ligaments. The normal position of the body of the uterus is anteflexion (bent for-

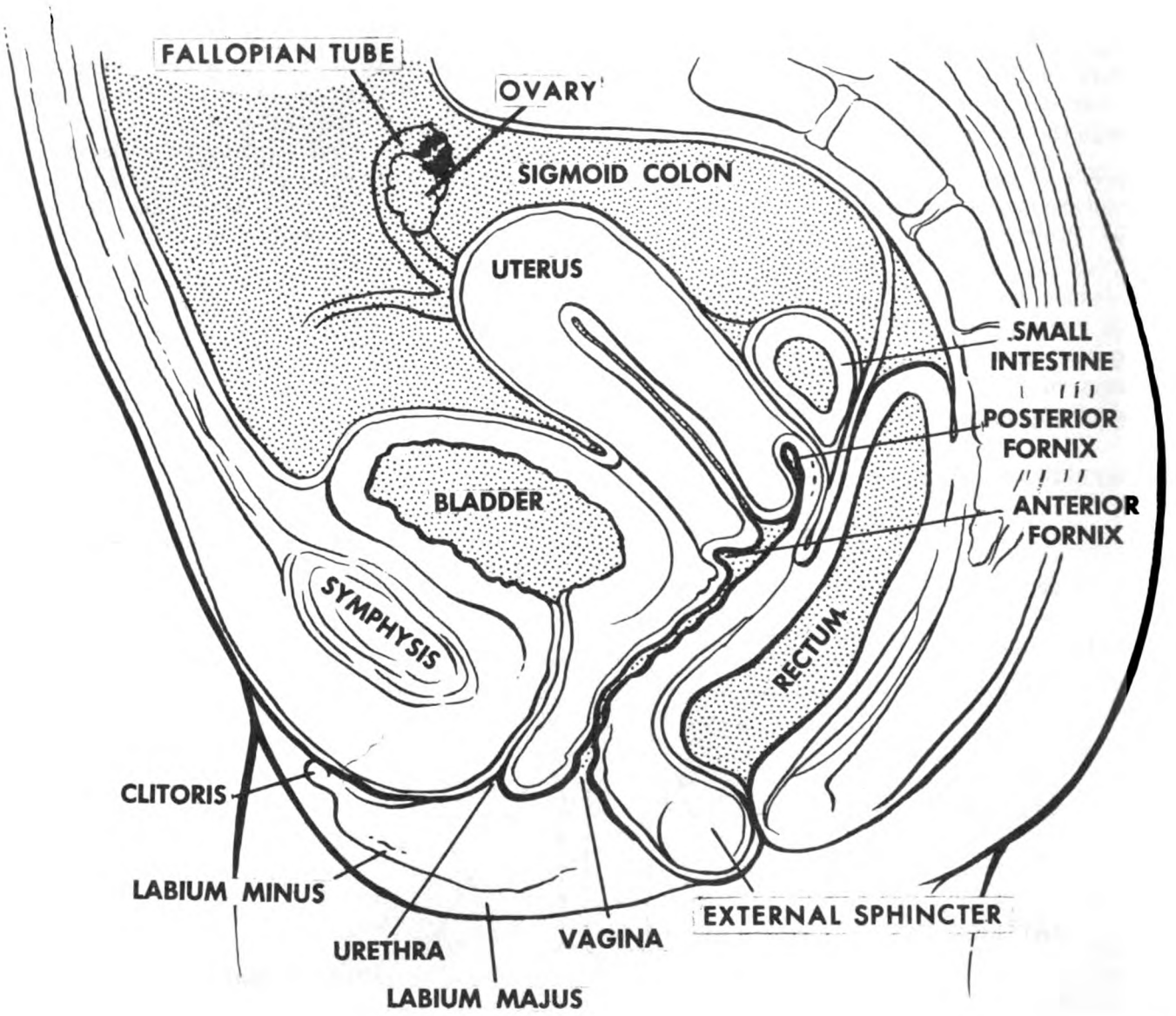


Figure 2–36. Female urogenital system.

ward over the bladder) (fig. 2–36). The uterus is about three inches long and three inches thick at its widest part. It has a thick wall of smooth muscle and a relatively small inner cavity. During pregnancy, it can increase about 20 times in size. The upper dome-shaped portion of the uterus is the fundus, the main part is the body, and the lower neck portion is the cervix (fig. 2–37). The cervix is a canal opening into the vagina. The inner lining of the uterus, the endometrium, undergoes periodic changes during the regular menstrual cycle, to make the uterus ready to receive a fertilized ovum. If the ovum is not fertilized, the endometrium gets a message from hormone influences and sheds its surface cells and built-up secretions. Some of the extra blood supply, the surface cells, and uterine secretions are eliminated as menstrual flow.

d. The Vagina. This muscular canal extends from the cervix of the uterus to the vaginal opening in the vestibule of the vulva. The vaginal canal is capable of stretching widely and serves as the birth canal. Part of the cervix protrudes into the uppermost portion of the vagina. An important part of a female pelvic examination is the physical examination of the visible surface of the cervix and vagina, plus a laboratory examination of cervical and vaginal secretions. A Pap (Papanicolaou) smear is made by obtaining these secretions for laboratory examination.

e. The Vulva. The several structures that make up the female external genitalia form the vulva. These are the mons pubis, the labia, the clitoris, and the vestibule. The labia, two parallel sets of liplike tissues, are the labia majora, the larger outer folds of tissue, and the labia minora, the smaller inner folds. The clitoris is located at the upper meeting point of the labia majora and the labia minora. Between the labia minora is the vestibule, a shallow depression into which the urethra and the vagina open. The urethral opening is above the vaginal opening. A series of glands, which can become infected, open into the vestibule, the largest being the Bartholin glands at the vaginal opening.

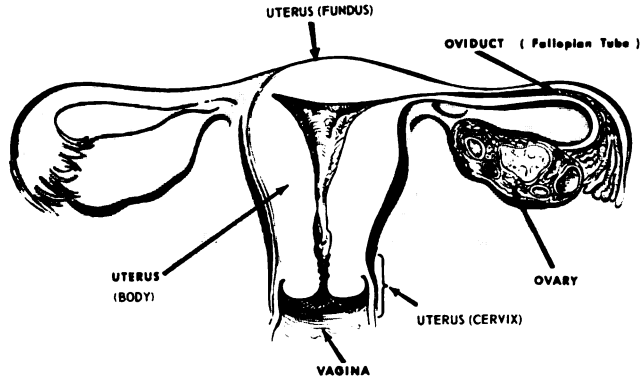


Figure 2–37. Female reproductive organs (frontal section).

2–87. Menstruation

In preparing to receive the ovum, the mucous lining (mucosa) of the uterus becomes soft and swollen and uterine blood vessels are dilated. If the ovum is not fertilized, the unneeded blood and mucosa are expelled from the uterus through the vagina. This process, called menstruation, begins at puberty and is repeated, except when interrupted by disease or pregnancy, about every 28 days until the age of 40 to 50 years.

CHAPTER 3

DISEASE AND INJURY

Section I. CAUSES AND CLASSIFICATION

3-1. General

Health is a state of physical and mental well-being in which the body is able to function fully, with comfort and with the ability to renew and restore itself. On the other hand, disease is any departure from health; it is any disorder of a body system that interferes with the normal operation of a body process. For the purposes of this manual, disease (or sickness) will be defined as any departure from health that is caused by pathogenic organisms or any other factor not involving an external physical force; injury (wound) will be defined as any departure from health due to an external physical force or environmental condition.

3-2. Causes and Classification of Disease

a. Causes. The following broad groupings are recognized causes of disease:

(1) *Pathogenic.* Pathogenic (disease-producing) organisms cause infectious diseases.

(2) *Nutritional.* Diseases caused by malnutrition (improper or insufficient nutrition) are classified as deficiency diseases. These may be diseases due to a lack of sufficient food or essential elements in the diet, or diseases due to the failure of the body to use the nutrients available in the food.

(3) *Degenerative.* Generally speaking, degeneration (breaking down) of tissues and organs is associated with old age disorders that are a part of the normal wear and tear of the aging process. However, degeneration may occur at any age as a result of chronic infection or repeated injury which leads to a loss of vitality or function. Arthritis, for example, may result from aging, injuries, or infections.

(4) *Anomalies.* These are abnormalities in structure and functions of body organs which are present at birth and result in less than perfect normal body functions. Examples of these are cleft ("hare") lip and congenital heart disease.

(5) *Neoplasms.* Abnormal growths of cells with no useful purposes are neoplasms (new growths). Cancer and other types of tumors are neoplasms, causing impaired functioning of affected body parts.

b. Predisposing Causes. These are factors that increase the probability of an individual becoming ill.

(1) *Age.* Age can be both a direct cause of disease, as in the senile degenerative process, or a predisposing factor, as in the childhood diseases.

(2) *Inadequate self-care.* Improper food, poor living conditions, and poor habits of personal hygiene make the body more susceptible to disease.

(3) *Emotional factors.* There is a close relationship between emotional upsets and physical disturbances. True physical illness can develop with emotional factors as a predisposing cause; for example, peptic ulcer or asthma.

(4) *Sensitivity reactions.* Some individuals are hypersensitive (allergic) to certain substances and develop severe reactions if they contact or take these substances into their bodies. Allergic tendencies are considered to have hereditary factors.

c. Classification. Diseases can be classified according to their cause and according to their duration and severity.

(1) *Acute disease.* A disease characterized by a rapid onset and by rapid changes in its progress and symptoms. (An acute disease is not necessarily a serious disease. The common cold, for example, is an acute disease that can be severe, moderate, or mild.)

(2) *Chronic disease.* A continuous or recurrent persistence of a disease.

(3) *Primary disease.* A disease developing independently of any other disease.

(4) *Secondary disease.* A disease that develops as a result of a primary disease or as a result

of an injury. In a secondary disease, the body may have much less capacity to deal effectively with additional impaired functions.

3-3. Classification of Injuries

Injuries and wounds are classified by type, location, and causative agent. The extent of injury is described as severe, moderate, slight, superficial (involving surface tissue only), or deep (involving tissues below the subcutaneous layer). When there is no break in the continuity of the skin or mucous membrane, the injury is referred to as a closed wound. When the skin or mucous membrane is cut or penetrated, the injury is referred to as an open wound.

a. Classification by Type.

(1) *Abrasion.* A wound in which outer layers of the skin have been scraped off (fig. 3-1). An abrasion results when a rough object is rubbed forcibly along the skin.

(2) *Contusion.* A subcutaneous or deeper tissue injury, commonly called a bruise, caused by impact with a blunt object. Swelling and black and blue discoloration (ecchymosis) occur as blood leaks internally from injured capillaries. The blood which collects in a pocket of tissues is a hematoma.

(3) *Strain.* A tearing of a muscle or of a tendon attachment of a muscle to a bone due to a sudden and forceful stretching or overexertion in lifting or carrying heavy weights.

(4) *Sprain.* An injury caused by overstretching or tearing ligaments around a joint due to a sudden twisting or stretching of the joint beyond its normal range of motion.

(5) *Dislocation.* This is the displacement of the normal relationship of the bones forming a joint (fig. 3-2).

(6) *Fractures.* A break in a bone. When there is a communication from the broken bone to the outside surface of the skin through a wound channel or by protrusion of a bone fragment, it is an open fracture. When there is no communication to the overlying skin, it is a closed fracture.

(7) *Incision.* A wound made by a sharp-edged instrument such as a knife or razor blade. The wound edges are smooth (fig. 3-1).

(8) *Laceration.* A wound that is irregular and torn, with jagged edges (fig. 3-1). It is usually caused by objects such as shell fragments, broken glass, or splinters.

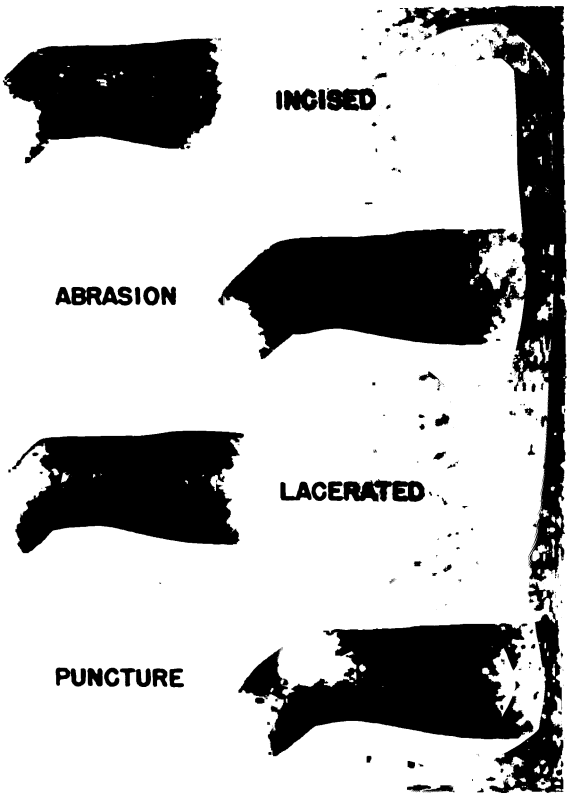


Figure 3-1. Types of wounds.

(9) *Penetrating wound.* A wound in which a foreign object enters but does not go through the body. There will be a wound of entry but none of exit.

(10) *Perforating wound.* A wound that goes all the way through the body or organ. There will be wounds both of entry and of exit.

(11) *Puncture.* A stab wound, caused by a sharp, pointed object such as a nail, icepick, or needle (fig. 3-1). The wounding agent may have been withdrawn from the injured area but foreign bodies, including bacteria, that have been carried deep into the tissues may remain.

(12) *Rupture.* A bursting or breakthrough of a muscle or internal organ through its surrounding membrane. A rupture results from the application of internal or external pressure. With a rupture, there may be no injury to the skin or no external evidence of a wound.

b. Classification by Location. Wounds are classified according to anatomical parts of the body as head wounds (these are subdivided into skull, face, and jaw wounds); chest wounds; abdominal wounds; wounds of the extremities (arms or legs); wounds of joints; and spinal and pelvic wounds. The part of the body most severely in-

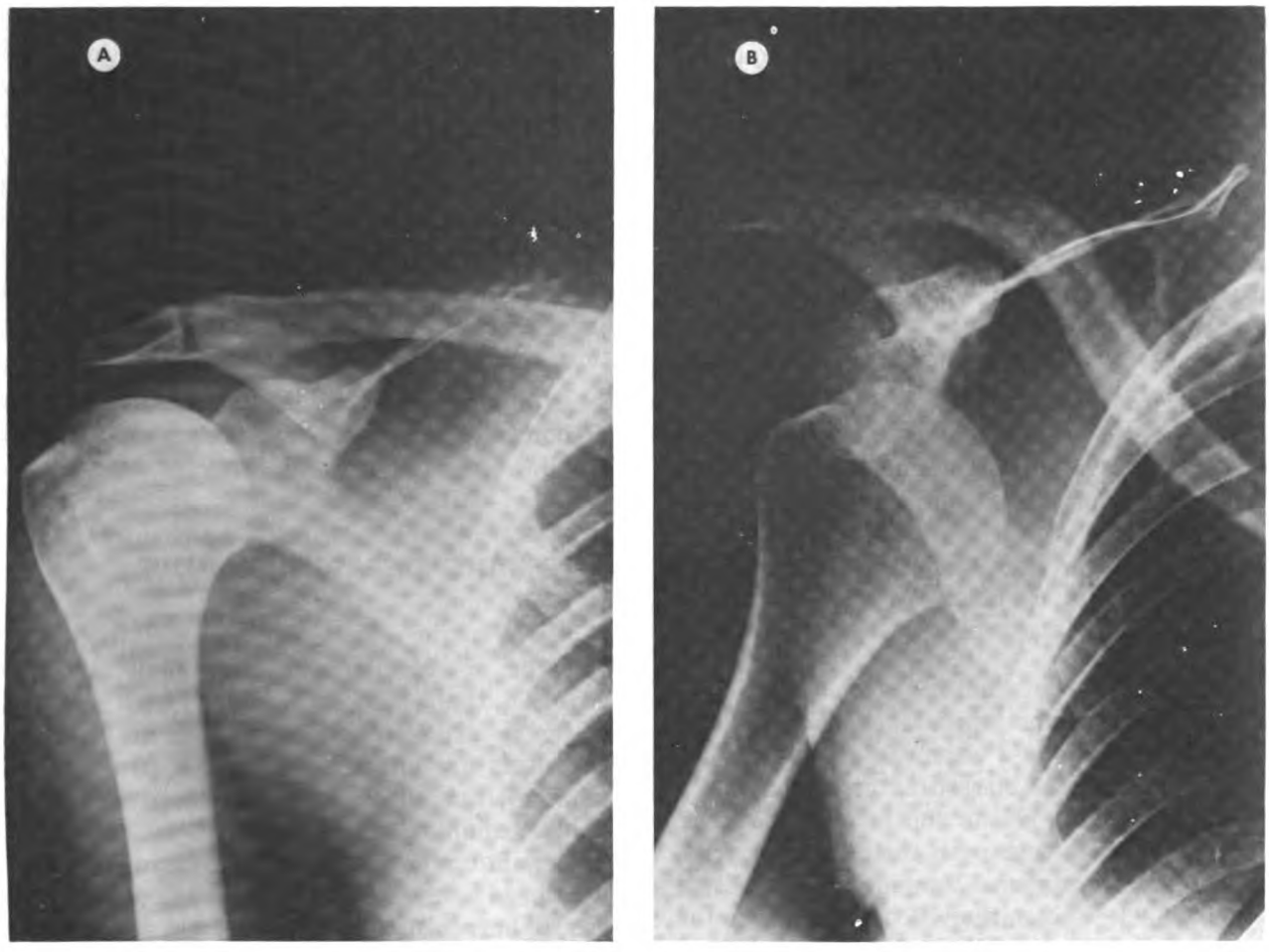


Figure 3-2. X-rays of (a) normal joint and (b) dislocated joint.

jured determines the primary classification of multiple wounds.

c. Classification by Causative Agent. The agent responsible is especially important in diagnosis and treatment because of some known factors in the type of tissue damage that results from different causative agents (fig. 3-3).

(1) *Bullets.* Bullet wounds may be penetrating or perforating. Wounds of entrance and exit may be small unless the bullet hits a bone. Damage to the surrounding tissue will depend on the velocity of the missile.

(2) *Missile fragments.* Sharp, jagged pieces of metal, wood, or glass of almost any size can cause lacerated wounds with much tissue damage. These fragments usually leave no wound of exit (remain embedded in the tissue), so foreign bodies will remain which must be surgically removed.

(3) *Burn agents.* Burn injuries may be caused by thermal (heat) agents such as open flames, steam, or hot gases; by contact with chemicals such as acids, alkalies, or hydrocarbon fuels

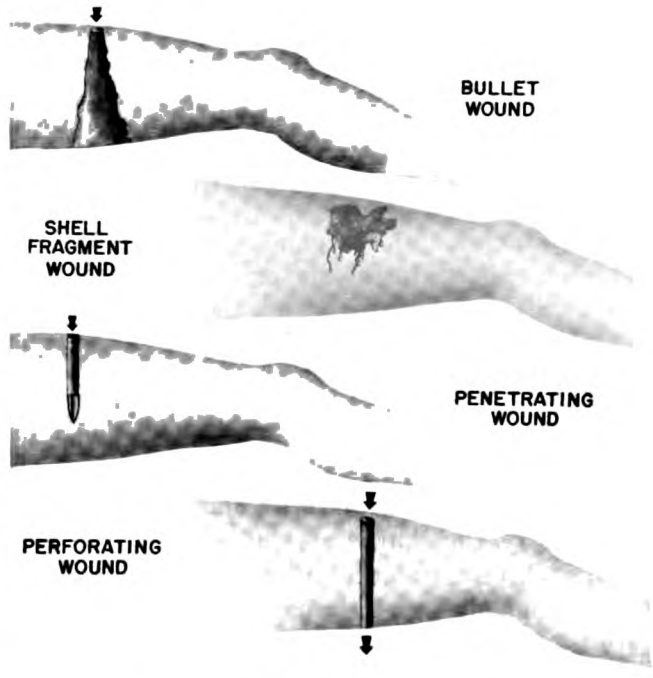


Figure 3-3. Causative agents and effects.

(such as gasoline); by electricity (lightning or electric current); or by radiation from radioactive materials and X-ray machines. The inhalation of flames or hot gases may cause burns of the respiratory tract that require priority treatment because of obstruction to the airway.

(4) *Blasts.* Blasts (explosions) result in sudden, terrific changes in pressure causing rupture of abdominal organs, injury to the lungs resulting in edema and hemorrhage, or injury to the brain (concussion). Frequently, there will be no open wound from this type of agent.

(5) *Kinetic energy.* When a moving vehicle stops suddenly, the passenger continues in motion. Blows received from impact against the vehicle interior cause many serious injuries to internal organs, head, or chest. The sudden stop itself may cause a so-called "whiplash" injury of the cervical vertebrae if the head is suddenly snapped forward and backward. The same kinetic injuries occur when a body is flung against a wall or ground by blast effect.

(6) *Poison.* Puncture wounds into which poison has been introduced are a special complication. Examples are snake and insect bites.

(7) *Environmental.* Extremes of temperature or humidity may cause injury such as heatstroke, frostbite, and immersion foot.

Section II. PATHOGENIC ORGANISMS AFFECTING DISEASE AND INJURY

3-4. Microorganisms

All things that exist in nature are classified into three general groups—animal, vegetable, and mineral. The animal and vegetable groups are living and are therefore classed as organisms (any living thing). Living plants and animals too small to be seen singly except with the aid of a microscope are microorganisms. Varying in size, shape, and their effect on man, they become visible to the naked eye only when they form colonies or groups.

a. Classification. Microorganisms belonging to the animal kingdom are called protozoa; those belonging to the vegetable group are the bacteria, fungi (yeasts and molds), the rickettsia, the spirochetes, and the viruses. Protozoa cause such diseases as malaria and amoebic dysentery. Most infectious diseases of man are caused by bacteria or viruses.

b. Prevalence. Microorganisms are found almost everywhere; in the air, on uniforms, on the hands, on the furniture, on the feet, on flies and other insects, and on the floor. They are even taken into the body with every breath and with every mouthful of food. Fortunately, many of these are nonpathogenic (not harmful) to man. Moreover, natural body defenses protect to a certain extent against the harmful ones. As microorganisms are constantly present even in the air itself, complete absence of microorganisms on items commonly used is impossible. The goal is to have as few microorganisms present as possible by using all known preventive measures against infection and disease.

c. Destruction. There are many methods of destroying microorganisms, but some are more effective than others. Washing with soap and water or exposure to light, fresh air, heat, and chemicals are effective only with some microorganisms, not all. The only known methods that assure complete destruction of microorganisms are steam under pressure (autoclaving, the procedure used by most hospitals), burning (flaming or actual burning), and exposure to a gas such as ethylene oxide. These three methods destroy even resistant spores (microorganisms encased in a hard outer shell) and leave an article sterile (absolutely free of all microorganisms).

3-5. Classification of Pathogenic Organisms

a. Bacteria. Bacteria are minute, one-celled organisms that may occur alone or in large groups called colonies. Each bacterium is independent and may live and reproduce by itself.

b. Viruses. Viruses are protein bodies which are smaller than bacteria. They can multiply only in the presence of living cells. They cause measles, mumps, influenza, and certain other ailments.

c. Rickettsia. Rickettsia are organisms that are larger than viruses but smaller than bacteria. They are carried and spread chiefly by insects such as mites and ticks and cause diseases such as typhus and Rocky Mountain spotted fever.

d. Fungi. Fungi are simple plant organisms which are larger than bacteria. They most often attack the skin, including the hair and nails, causing such chronic infections as ringworm and ath-

lete's foot. Infections caused by fungi are called mycotic infections and can be serious when internal organs are invaded.

e. Worms. A few kinds of worms can live inside the human body and cause disease. The medical term for this general class of worms is helminth. Hookworms and tapeworms are examples of helminths that are common intestinal parasites.

f. Protozoa. Protozoa are one-celled animals, a few of which cause illness in man. Important diseases caused by protozoa include systemic infections such as malaria and amebic dysentery and a local infection such as trichomoniasis which affects the external genitalia.

3-6. Classification of Bacteria

The identification of bacteria under the microscope helps to confirm the diagnosis of many infectious diseases. Bacteria can be classified and described in terms of shape, oxygen requirements, ability to cause disease, and ability to form spores.

a. Classification by Shape. Significant bacteria can be divided by their shape into three main groups. These groups are the cocci, round or ball-shaped bacteria; the bacilli, slender rod-shaped bacteria; and the spirochetes, corkscrew-shaped bacteria.

(1) *Cocci.* The cocci are characterized by formation of pus (pyogenic bacteria). Primary members of this group are staphylococci, streptococci, and diplococci.

(*a*) Staphylococci group themselves in grapelike clusters. They form thick, yellow or white pus. They cause most boils, pyogenic infections of the fingers and hands, and "stitch abscesses" in surgical wounds. They can always be found on the normal skin and almost always in the nasal passages.

(*b*) Streptococci arrange themselves in chains or beadlike formations. They form a thin, watery pus. Streptococci cause a type of infection that tends to spread within body tissues to a greater extent than infections caused by staphylococci. Common in the mouth and throat, they cause systemic disease such as scarlet fever, as well as extremely serious wound infections.

(*c*) Diplococci arrange themselves in pairs. They cause such infections as gonorrhea and meningococci menigitis.

(2) *Bacilli.* Bacilli are characterized by variations in their rod shape from straight to irregular curved and branched shapes. Some bacilli form spores within themselves which may alter their appearance to a bottle or drumstick shape.

(*a*) Escherichia coli belong to a group of true rod-shaped bacilli which normally live in the human intestinal tract. This bacillus is found in the intestinal tract and on the skin of the perineal area. When introduced into wounds, it produces infection characterized by light brown pus with a fecal odor.

(*b*) Clostridium tetani belong to the rod-shaped spore formers that appear drumstick shaped while they contain the spores. The spore of clostridium tetani finds conditions favorable for changing back to its original form when introduced into wounds. Tetanus (lockjaw) is caused either by the introduction of clostridium tetani or by the introduction of its spores.

(*c*) Corynebacterium diphtheria are usually short, thick rods in palisade (picket fence) arrangement. They cause diphtheria and are spread by nasal or oral droplets from infected persons, as well as by direct contact.

(3) *Spirochetes.* The spirochetes are characterized by their corkscrew shape and their ability to move or twist. Treponema pallidum causes syphillis, a communicable disease, usually venereal. The source of infection is contact with lesions of the infected person or, rarely, with moist infected body secretions.

b. Classification by Oxygen Requirements. Bacteria are divided into two classes, depending on their ability to live in the presence of free oxygen.

(1) Aerobic bacteria grow only in the presence of free air or oxygen. Most species of streptococci and staphylococci are aerobic.

(2) Anaerobic bacteria cannot live in the presence of free air or oxygen. Clostridium tetani and clostridium welchii (causing gas gangrene) are anaerobic and are found in street dirt and manured farmland. This is important in the prophylactic and definitive treatment of all traumatic wounds. These organisms may penetrate any deeply contused, lacerated, or punctured wound. If the blood supply and, therefore, the oxygen supply of these tissues is defective, serious infection will occur.

c. Classification by Ability to Cause Disease. Not all bacteria are harmful. Many species of bac-

teria in the soil and the air do not ordinarily cause disease in human beings. In addition, there are bacteria which are harmful to animals but not to man. In this manual, organisms that are referred to as nonpathogenic are those which usually do not cause disease in human beings.

d. Classification by Spore Formation. Some bacteria can form spores. In the spore state, the bacteria has produced a wall around its cell which is very resistant to heat and requires prolonged exposure to high temperature and moisture or gas for destruction. The spore forms must be killed in any method used for surgical sterilization, for they can become active bacteria capable of causing severe infections. The most dangerous spore formers are the tetanus bacilli and the bacilli that cause gas gangrene.

3-7. Distribution of Bacteria

a. Since bacteria are known to be present in air, water, food; on manmade objects or normally clean skin; and in the mouth, throat, and intestines of healthy human beings, the possible sources of disease and wound infection are almost countless. Pathogenic organisms responsible for diseases other than wound infections are usually inhaled or swallowed. Pathogenic organisms responsible for wound infections are usually introduced through a break in the continuity of the skin.

b. Bacteria flourish in moist surroundings at temperatures near that of the human body. Under less favorable conditions they may continue to exist, without multiplying, for a long time. Usually, all but spore-forming bacteria are eventually destroyed by exposure to sunlight or by drying.

3-8. The Body's Defenses Against Pathogenic Organisms

The body has four lines of defense to combat bacteria. In the healthy body, these defenses show a remarkable ability to fight off bacteria and to withstand their effects. However, such factors as injury, exposure, fatigue, and malnutrition lower the body's defenses.

a. The first line of defense, the skin, protects the body's surfaces. It acts like a wall to keep out most bacteria. Bacteria that enter the nose and mouth find another barrier, the mucous membrane that lines the respiratory and digestive systems. Some cells of the membrane secrete mucus which entangles bacteria, while others have cilia which sweep bacteria out of the body.

b. The second line of defense is formed by the white blood cells (wbc) or phagocytes. They engulf and destroy bacteria that pass through the first line of defense. This function of white cells, called phagocytosis, is described in paragraph 2-41.

c. The third line of defense is immunity. Previous encounters of the body with bacteria will produce a specific resistance or immunity to those particular organisms. This acquired immunity is associated with the formation of antibodies by the body. These antibodies interfere with bacterial invasion in several ways. They may neutralize bacterial toxins, kill the bacteria, make the bacteria more susceptible to attack by white blood cells, or cause the bacteria to clot into little clumps which the white cells can destroy easily.

d. The fourth line of defense is the lymphatic system. Lymph cleans tissues, then flows through vessels into lymph nodes. The nodes act as filters for removal of bacteria.

Section III. BODY REACTIONS TO DISEASE AND INJURY

3-9. Inflammation

Inflammation is the local reaction of the body to irritation or injury. It occurs in tissue that is injured but not destroyed. It is a defensive and protective effort by the body to isolate and eliminate the injuring agent and to repair the injury. A certain degree of inflammation takes place following any type of injury, including a wound made under aseptic conditions by a surgeon.

a. Causes. Inflammation can be caused by physical, chemical, or bacterial injuring agents.

b. Signs. The signs of inflammation are redness, heat, swelling, pain, and disturbance of function. These five signs are produced by reaction of blood vessels and tissue in the injured area. When injury occurs, the blood vessels dilate, thus increasing the supply of blood to the injured area. The blood is warm and red, producing the first two signs, redness and heat. As the blood vessels dilate, their walls leak and blood serum escapes into the tissues. This results in swelling. Pressure of the swelling on nerve endings causes pain. Disturbance of function can result from the pain or

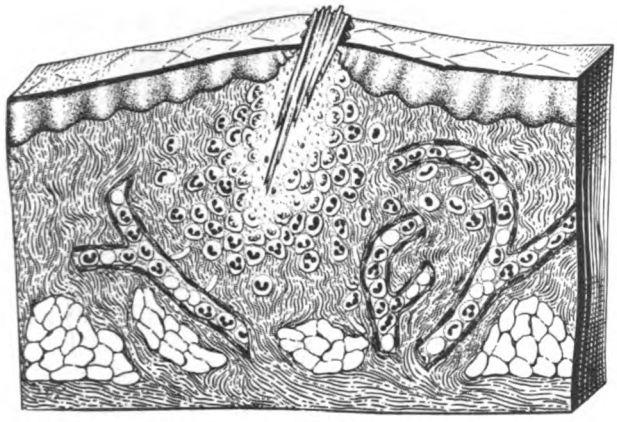


Figure 3–4. Tissue changes in inflammation illustrating phagocytic action of wbc.

Figure 3–5. Healing by primary union.

from interference by the swelling. While changes in blood vessels are producing the cardinal symptoms of inflammation, the body is reacting to the injury in another way. White cells leave the dilated blood vessels and move through the tissue fluids to the site of injury (fig. 3–4). The cells make a wall around the area to seal off the injurious agent. Within this area the white cells work as scavengers (phagocytes), ingesting small particles of foreign matter, dead tissues, or bacteria if present. As the source of injury is overcome or expelled, tissues return to normal. White cells disperse. Blood vessels return to normal size. Fluids flow away through the lymphatics. If tissue has been destroyed, it is replaced by scar tissue. Thus, the dilation of blood vessels and the mobilization of white cells against the injuring agent are the two basic reactions in the inflammatory process.

3–10. Healing

Healing is a process related to inflammation, for both are started by tissue injury. It would be ideal if the body could heal itself by replacing all damaged tissues with an exact counterpart; then, an eye would be replaced with a new eye and a tooth with a new tooth. But very few tissues are replaced in kind. Examples of tissues which may replace themselves are liver tissue, kidney tubules, and connective tissue. Bone — which is one kind of connective tissue — may replace itself if broken; that is, the broken bone is repaired by the formation of new bony tissue. Healing in most tissues is, however, a process of replacement; the destroyed tissue is replaced by scar tissue (fibrous type of connective tissue). If brain cells are destroyed, they are replaced by connective tissue. If the heart muscle is injured, the damaged fibers are replaced by connective tissue. When a tooth is pulled or an eye is lost, the sockets are filled with connective tissue. Hence, replacement by scar tissue is the usual order in healing. The healing process takes place in one of two ways — by primary union or by granulation.

a. Primary Union. A clean incised wound with minimal tissue destruction will heal with very little scar formation. Properly placed sutures (stitches) hold the walls of the wound together, while fiber-forming cells carry repair fibers from one wall to another, binding them together. When the process is completed, the walls are held and healed by a thin scar of fibrous connective tissue. Epithelium grows out from the cut edges of the skin to cover the scar. The hairline appearance of the incision is evidence of healing by primary union (fig. 3–5).

b. Granulation. When wound edges are left open because of neglect, infection, or excessive loss of tissue, healing takes place by granulation. Granulation tissue is red, soft, and bleeds easily. It is formed of capillaries and fiber cells which gradually cover the walls and base of the wound. Granulation tissue eventually becomes connective tissue and gradually fills the wound. As the skin surface is covered by epithelium, complete healing takes place. A wound that heals by granulation takes a long time and results in a relatively large scar (fig. 3–6).

3–11. Infections

a. General. Infection is the entry and development or multiplication of an infectious agent in

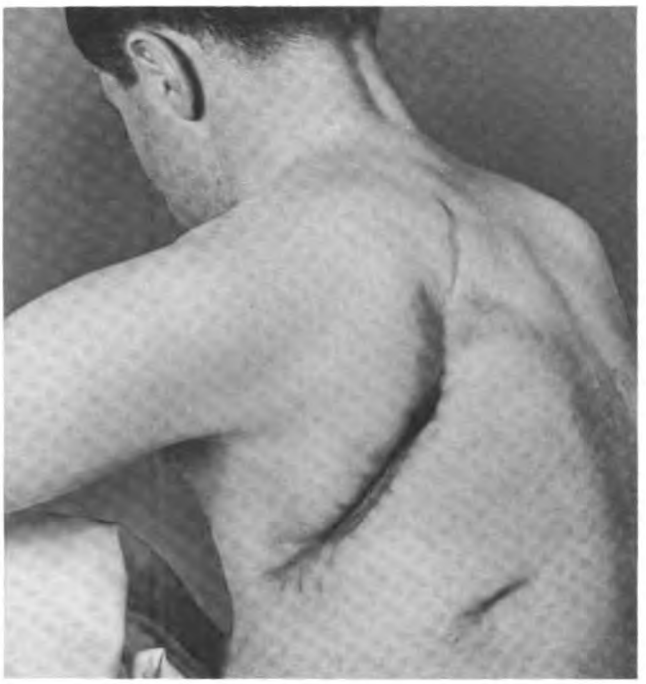


Figure 3-6. Healing by granulation.

the body. The agent can be any pathogenic organism. Factors that contribute to the ability of the infectious agent to produce infectious disease include the number and kind of invading organisms, the ability of the body to resist infection, and the virulence of the infecting organisms. Virulence is the ability of pathogenic organisms to overcome, at least temporarily, the defensive reactions of the body (phagocytosis, immunity, and lymphatic involvement) which are all mobilized when infection occurs. Virulent organisms have the ability to multiply rapidly within body tissues and to form toxins (poisonous waste products). Pathogenic organisms produce different kinds of toxins; some toxins destroy tissue cells, some dissolve blood cells (hemolysis), and some are absorbed rapidly into the blood to cause toxemia, a generalized systemic reaction to infection.

b. Acute Local Infection.

(1) In an acute local infection, the five signs of inflammation are usually intensified. In addition, pus usually forms (suppuration). In the process, white cells attempt to wall off and localize the accumulating toxic material. A walled-off accumulation of pus is an abscess, which may occur in any part of the body. The condition that results when pus spreads into subcutaneous tissue surrounding an abscess is cellulitis.

(2) A common skin abscess such as a furuncle (boil) is an example of a localized infection

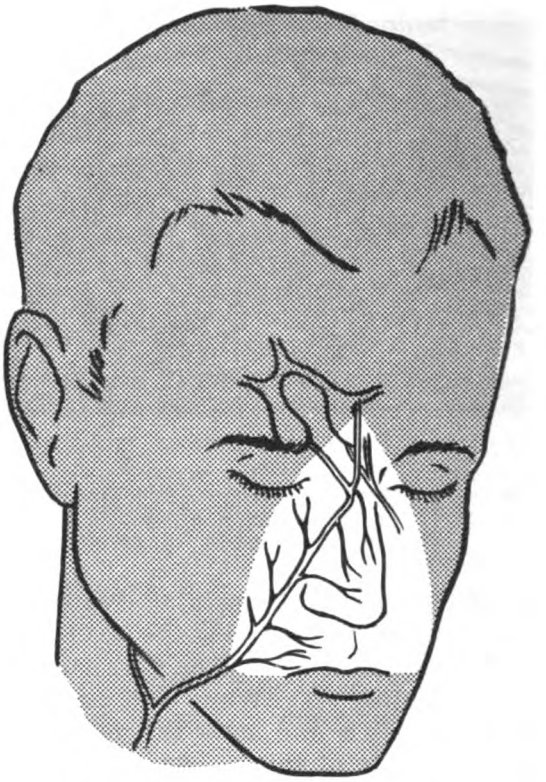


Figure 3-7. Danger area of the face.

caused by staphylococci. The lesion begins as a pustule (a blister containing pus). As the pustule enlarges, the skin becomes reddened, tense, and shiny. Usually the furuncle comes to a head rapidly and ruptures spontaneously, discharging pus. Furuncles may be single or multiple but tend to occur in crops. They may occur anywhere on the skin, particularly on the extremities, buttocks, back of the neck, axillae, and face. Furuncles on or about the nose, upper lip, or beneath the eyes may endanger life by extension along the veins of the face which drain into the venous sinuses of the brain. This is the danger area of the face (fig. 3-7) since a spread of infectious material into the brain can cause encephalitis (inflammation of brain tissue).

c. Signs and Symptoms of Systemic Infection. As infection spreads beyond a local area, the characteristic signs of systemic infection appear: fever, increased pulse and respiratory rates, headache, malaise (vague general body discomfort), and oftentimes chills. Fever and an increased white blood count (leucocytosis) are considered favorable signs that the internal body defenses are fighting back at the invading organisms. However, general systemic signs are indications that toxemia has caused severe disturbances in many

body organs and systems. Infections in an extremity that spread from an initial infected area cause signs indicating involvement of lymph channels and adjacent lymph nodes. Red streaks radiating from an infected area are signs of lymphangitis (inflammation of lymph channels), while swollen, tender glands in the neck, armpit, or groin when the head, arm, or leg, respectively, is involved are signs of lymphadenitis (inflammation of the lymph glands).

3–12. General Therapeutic Measures in Acute Inflammation and Infections

The general therapeutic measures used in treating acute inflammation and infection are based on the need to (1) assist the body to mobilize its natural internal defenses, (2) relieve pain, (3) promote healing, (4) prevent complications, and (5) control the spread of infectious organisms when present. The general measures used are rest, elevation of an involved extremity, use of heat or cold, drug therapy, promotion of elimination of waste products, and aseptic procedures to prevent and control the spread of infection.

a. Rest. Rest allows all the body's defensive effort to be directed toward healing and combating infection. This can hasten the defensive process of walling off an infected area, which will prevent the body from absorbing too much toxin. Rest also reduces movement of an inflamed and painful part.

b. Elevation. Elevation of an inflamed extremity permits the force of gravity to drain swollen tissue spaces and blood vessels. The degree of elevation needed to promote tissue drainage of an extremity is above the heart level. To provide this degree of elevation for the arm, the hand and elbow must be higher than the shoulder; for the leg, the foot and knee must be higher than the hip. A patient for whom rest and elevation of an arm or a leg is ordered must, therefore, usually be confined to bed with the involved extremity elevated along its entire length on properly placed pillow supports.

c. Heat or Cold.

(1) *Effect of heat.* Heat applied to the body dilates the capillaries and increases blood flow. The improved blood supply increases the number of white cells in the area to combat pathogenic organisms and aid the formation and localization of pus. Heat is never applied, however, in undiagnosed abdominal inflammatory conditions—if the inflammation is due to an inflamed appendix, the application of heat could contribute to a ruptured appendix and peritonitis.

(2) *Effect of cold.* Cold causes the blood vessels to constrict and also tends to reduce edema. It reduces the pain of inflammation because it reduces the sensitivity of nerve endings in the skin. When applied immediately after an injury, it prevents or relieves swelling.

d. Drug Therapy. The type of drug to be used in combating inflammation and infection is determined by the medical officer when the infecting organism is identified. Cultures, smears, or the development of particular signs or symptoms help in this identification. In addition to anti-infective or anti-inflammatory drugs, analgesic drugs to relieve pain and to insure rest are often indicated.

e. Promotion of Elimination. Toxic materials are eliminated largely by the kidneys. A daily urinary output of at least 1000 ml. is necessary. An increased fluid intake (4000 ml. or more) helps dilute toxins and protect the kidneys. Increased fluid intake also helps bowel elimination.

f. Aseptic Procedures. Asepsis means freedom from disease-producing microorganisms. The procedures used to accomplish this are classified as medical asepsis and surgical asepsis.

(1) *Medical asepsis.* All of the procedures used that make it possible to care for patients while preventing and controlling the spread of infectious organisms. They include hand washing, disposing of infectious wastes, disinfecting and sanitizing (cleaning) articles after use, and isolating patients with communicable infectious conditions to reduce their contact with other individuals. Medical asepsis reduces the transmission of pathogenic organisms from one person to another.

(2) *Surgical asepsis.* All of the procedures used to sterilize and to keep sterile any object or article that is to be introduced into a wound or that is to penetrate the skin or mucous membrane. Surgical asepsis prevents the introduction of pathogenic organisms into body tissues.

CHAPTER 4

PHARMACOLOGY AND DRUG ADMINISTRATION

Section I. INTRODUCTION TO PHARMACOLOGY

4-1. General

Safe and effective administration of drugs is an essential part of patient care. The medical specialist in carrying out his duty assignment may be required to administer prescribed drugs; for this exacting duty he must have preparation and supervised experience both in a classroom setting and in a clinical area (hospital ward and dispensary). Since administration of drugs is an accepted function of a professional nurse, it is customary that instruction and supervised experience in drug administration be conducted by a nurse officer in AMEDD training and medical treatment facilities. The medical specialist who has demonstrated his competence to administer drugs performs this duty only in accordance with written local policy directives.

4-2. Definitions

a. Pharmacology. This is the science of drugs, especially the actions of drugs on the body, including materia medica and therapeutics. No drug can introduce a new action in the body; all that any drug can do is modify actions which are already there. Drugs can either increase or decrease the actions or functions of cells.

b. Materia Medica. This is the branch of medical science which deals with the source, properties, preparation, and doses of drugs.

c. Therapeutics. This subject deals with the actions of drugs in the treatment of disease.

d. Drug. A drug is any substance, or mixture of substances, used in the treatment, prevention, or diagnosis of disease. The terms drug and medication can be used interchangeably.

e. Poison. A poison is a substance which when absorbed or ingested into the body may alter physiology to a mild or a critical extent by damaging body tissues or cells.

f. Toxicology. This is the study of poisons and their actions, the treatment of poisoning, and the use of antidotes.

g. Pharmacy. This is the art and science of preparing and dispensing drugs for medical purposes. Pharmaceutical is the adjective which means "pertaining to pharmacy."

h. USP. The United States Pharmacopeia is an official reference on the source, preparation, potency, and doses of commonly used and valuable drugs.

i. NF. The National Formulary is an official companion reference to the USP. It contains many commonly used drugs and preparations not included in the USP. It designates their sources, methods of preparation, standards of purity, and dosage.

j. Official Drug or Preparation. An official drug or preparation is one that is listed in the USP or NF.

k. ND. This abbreviation refers to *New Drugs.* It is a book published annually by the American Medical Association giving the characteristics and doses of newly developed drugs that have not yet been admitted to the USP or NF.

l. PDR. This abbreviation refers to *Physician's Desk Reference,* published yearly by a private company. Drug manufacturers cooperate in the preparation of this book, and major products of the companies are listed. Current copies of the PDR are often available in a hospital ward.

4-3. Drug Legislation

State and Federal legislation provide for the enforcement of drug standards to protect the public from fraud or from exposure to unsafe or unreliable drug preparations. Three Federal laws covering drugs are the Food, Drug, and Cosmetic Act (FDCA), the Harrison Narcotic Act, and the Drug Abuse Control Act.

a. The Food, Drug, and Cosmetic Act. The FDCA provides broad coverage on the manufacture and distribution of drugs in interstate commerce to prevent false and misleading statements and to provide for controlled dispensing of drugs

considered unsafe for self-medication. Amendments to the FDCA require that drug preparations be labeled and that all habit-forming and potentially toxic drugs have on the label this statement: "CAUTION: Federal law prohibits dispensing without prescription."

b. The Harrison Narcotic Act. This act is the Federal narcotic control law which regulates the importation, manufacture, prescription, sale, and use of drugs defined as narcotics and of specified drugs defined as addiction forming. All products, natural and synthetic, of opium and cocaine are covered except for some specific exemptions. The law provides for distribution of controlled drugs through medical channels and for legal medical use only. Everyone handling the drugs specified in the law is accountable for their use. Careful and accurate records must be maintained, subject to Federal inspection and, except as specified in the law, the possession of narcotics is a Federal crime.

c. The Drug Abuse Control Act. The Drug Abuse Control Act governs the distribution and control of barbiturates, amphetamines, and habit-forming drugs. Drugs which have a potential of abuse because they produce a depressant, stimulating, or hallucinogenic effect on the central nervous system also come under this law.

4–4. Drug Nomenclature

Three name classifications of drugs are the chemical-scientific name, the generic name, and the brand or trade name.

a. Chemical-Scientific Name. This name specifically identifies the compound and is useful to a few technically trained personnel.

b. Generic Name. The generic or official name of a drug is assigned by the producer of the drug in collaboration with the Food and Drug Administration and Council on Drugs of the American Medical Association. The generic name may be used by any interested party and is usually the name found in the USP and NF. The generic listing is usually used in the Federal Supply Catalog and in AMEDD pharmacies. A generic drug name is not capitalized; *for example,* aluminum hydroxide.

c. Brand or Trade Name. Trade names are copyrighted terms selected by a manufacturer to designate a particular product. Copyright laws prevent any other person from using the name, and other laws prevent pharmacists from substituting chemically identical products for the trade name article. When there are no longer any legal restrictions on the use of a brand name, the most widely accepted and familiar name may become the official or generic name. Aspirin is an example —in 1963, this drug, previously listed as acetylsalicylic acid, officially became aspirin, USP.

4–5. Sources of Drugs

There are five main sources from which drugs are obtained—

a. Mineral. Many mineral substances found in nature are used in drugs. *Examples:* iodine, zinc oxide, and magnesium sulfate (epsom salt).

b. Plant. Certain drugs are derived from vegetables and plants. *Examples:* digitalis, morphine, and senna pod extract.

c. Animal. The organs, tissues, and body fluids of animals (including man) are the source of some drugs. *Examples:* hormones, antitoxic serums, and gamma globulin from human blood.

d. Synthesis. Synthesis is the artificial building up of a chemical compound by the union of its elements. Drugs such as epinephrine that were once available only from natural sources can now be artificially reproduced through synthesis. Other drugs such as the sulfonamides were originally created through synthesis.

e. Microorganisms. Chemical substances produced by microorganisms such as fungi and bacteria are also sources of drugs. *Examples:* penicillin, tetracycline, and vaccines.

4–6. Types of Drug Preparations (fig. 4–1)

Drugs are compounded into various types of preparations, depending upon each drug's physical characteristics, the purpose for which intended, and the method by which it is to be administered. Some drugs are prepared in more than one form so they may be administered several ways. To give them bulk or form, drugs may be mixed with other substances which have no action or medicinal value. These substances are called vehicles. For a drug in aqueous solution, water is the vehicle; for a drug in an ointment, fatty substances such as petrolatum or lanolin are used as the vehicle. Drugs or mixtures of drugs that are divided into definite doses are dosage forms. Examples of dosage forms are capsules, tablets, ampules, and cartridge units. Some dosage forms prepared for oral administration are enteric coated with a special coating that resists the action of the stomach juices but dissolves in the intestine. This helps

prevent nausea, irritation of the stomach lining, or destruction of the drug. Scored tablets are marked with an indented line across the surface so that they can be broken in half, if half a tablet is the dose required. Drugs prepared with flavored coatings or in flavored vehicles are exceptionally hazardous to children if left where they have access to them. All drugs dispensed from an AMEDD pharmacy bear labels stating, "CAUTION: Keep out of reach of children."

a. Solid Preparations.

(1) *Capsule.* A drug placed in a gelatin container.

(2) *Tablet.* A drug compressed or molded into a flat disk or other shape.

(3) *Pill.* A powdered drug molded into a sphere. The word "pill" as a general term used for tablets is a misuse of the word.

(4) *Troche.* A drug preparation in a flat disk which is to be held in the mouth until dissolved.

(5) *Suppository.* A drug which is molded into shape for insertion into a body opening other than the mouth. Its vehicle, such as cocoa butter, melts at body temperature and the drug is released.

(6) *Ointment.* A drug suspended in a semisolid base such as petrolatum.

(7) *Powder.* A drug which is ground up and used in powder form.

b. Fluid Preparations.

(1) *Fluid extract.* A concentrated fluid preparation. Fluid extracts are 100-percent strength (1 ml. of the preparation contains 1 Gm. of the crude drug).

(2) *Tincture.* An alcoholic solution of a drug. Tinctures of potent vegetable drugs are 10 percent in strength; of less potent drugs, 20 percent in strength.

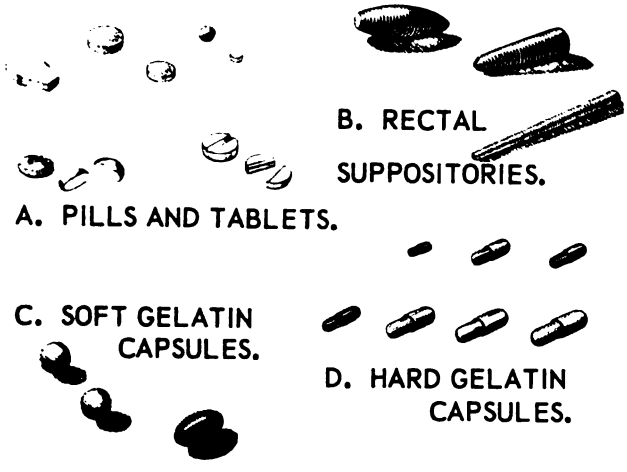


Figure 4-1. Solid preparation of drugs.

(3) *Elixir.* A solution containing water, alcohol, sugar, and flavoring substances, in which one or more drugs may be dissolved.

(4) *Spirit.* An alcoholic or hydroalcoholic solution of a volatile drug.

c. Abbreviations. Abbreviations commonly used in prescriptions, written orders, and on labels of drug containers are given below. The abbreviation and its meaning must be learned; the derivation is necessary only to show the connection with the abbreviation. Most are Latin words or phrases which are abbreviated as shown in tables 4-1, 4-2, and 4-3.

4-7. Prescriptions

a. Definition. A prescription is an order written by a physician or a dentist to a pharmacist, directing him to supply a patient named in the prescription with the quantities of drugs specified.

Table 4-1. Abbreviations Used in Dosage and Directions

Abbreviation	Derivation	Meaning
āā	ana	of each
ad	ad	up to
ad lib	ad libitum	as much as desired
b	bis	twice
C		centigrade
c	cum	with
cc		cubic centimeter
caps	capsula	capsule
Gm	gram	gram, grams
gr	granum, grana	grain, grains
gtt	gutta	drop, drops
(h)	hypodermic	under the skin
IM		intramuscular
IV		intravenous
kg	kilogram	thousand grams
l	liter	liter
Lb., lb	libra	pound
ml	milliliter	thousandth of a liter
ocul	oculus	the eye
o.d.	oculo dextro	in right eye
o.s.	oculo sinistro	in left eye
o.u.	oculus uterque	in each eye
p.o.	per os	by mouth
q.s.	quantum sufficit	a sufficient quantity
℞	recipe	take
s	sine	without
s.c., sub cut	sub cutem	subcutaneous
sig	signa	label, let it be labeled
s.o.s	si opus sit	if necessary
ss	semis	one-half
tab		tablet
tsp	teaspoon	teaspoonful
tbsp	tablespoon	tablespoonful
ʒ	drachma	dram
℥	uncia	ounce

Table 4-2. Abbreviations Indicating Time of Administration

Abbreviation	Derivation	Meaning
a.c	ante cibos	before meals
b.i.d	bis in die	twice a day
h	hora	hour
h.s.	hora somni	at bedtime
o.m	omni mane	each morning
o.n	omni nocte	each night
p.c	post cibos	after meals
p.r.n	pro re nata	when needed
q.d	quaque die	every day (daily)
q. 2 h., q. 3 h., q. 4 h		every 2, 3, or 4 hours
q.i.d., or 4. i.d	quater in die	four times a day
stat	statium	at once
t.i.d	ter in die	three times a day

Table 4-3. Abbreviations Indicating Hours of Administration

Abbreviations	Meaning
q.i.d	0800, 1200, 1600, 2000
q.2h	0600, 0800, 1000, 1200, etc.
q.3h	0900, 1200, 1500, 1800, etc.
q.4h	0800, 1200, 1600, etc.
q.6h	0600, 1200, etc.
b.i.d	1000, 1600
t.i.d	1000, 1500, and 1800
a.c	½ hour before meals: 0630, 1130, 1630
p.c	0800, 1400, 1800

NOTE

This list contains examples of hours of administration of drugs when the instructions of the physician indicate only the number of doses to be given each day. A local policy directive should be consulted, since hours of administration of drugs are customarily coordinated with local hospital hours for meal service ("lights out" at night, etc.).

Directions for use of the drugs are given by the physician or dentist and written on the label by the pharmacist. A prescription is a legal document and must be signed by an individual authorized to write prescriptions. Prescription forms must be dated, completely identify the patient, and in the AMEDD, use the metric system.

b. Parts. A prescription consists of—

(1) Date on which it was written.

(2) Name of the patient and, in the military, his ward or organization.

(3) The symbol ℞, an abbreviation of the Latin word "Recipe" meaning "Take thou . . ."

(4) Names and quantities of the drugs. Names may be written in English or Latin; amounts in the metric system. Army prescriptions are written in English with amounts in the metric system.

(5) Instructions to the pharmacist.

(6) Instructions to the patient. These should always be written in English.

(7) The signature of the physician.

Section II. WEIGHTS, MEASURES, AND CALCULATION OF DRUG DOSES

4-8. Pharmaceutical Weights and Measures

a. Two systems of weighing and measuring drugs are used. These are the metric system and the apothecary system. The metric system is the official system used by the Army. However, there may be occasions when drugs are prescribed in the apothecary system and a medical specialist qualified to administer drugs must know how to convert apothecary measurements to metric measurements. Table 4-4 lists metric doses with approximate apothecary equivalents. These equivalents represent the quantities usually prescribed under identical conditions in either the metric or the apothecary systems of weights and measures.

b. Certain abbreviations are commonly used and are shown in Table 4-4.

NOTE

The abbreviation for gram is Gm., with the initial letter always capitalized. The abbreviation for milligram is mg. and for milliliter is ml. Milliliter is the preferred fractional measure of the liter; formerly cubic centimeter or cc. was used.

4-9. The Metric System

The metric system is used in measuring length, volume, and weight. The meter is the basic or fundamental unit of length, the liter is the unit of volume or capacity, and the gram is the unit of weight. Subdivisions and multiples of metric units are based upon the decimal system, which means that they are divided or multiplied by 10, 100, or 1000 parts.

a. Subdivisions. When added to meter, liter, and gram, the prefixes below show that the basic metric unit is to be subdivided.

(1) Milli- means 1/1000 of a unit (0.001). *Examples*: millimeter (length), milliliter (volume), and milligram (weight).

(2) Centi- means 1/100 of a unit (0.01). *Examples:* Centimeter, centiliter, and centigram.

(3) Deci- means 1/10 of a unit (0.1). *Examples*: decimeter, deciliter, and decigram.

b. Multiples. These are expressed by adding the following prefixes to meter, liter, and gram:

(1) Kilo- means 1000 times a unit (kilometer, kiloliter, and kilogram).

(2) Hecto- means 100 times a unit (hectometer, hectoliter, and hectogram).

(3) Deka- means 10 times a unit (dekameter, dekaliter, and dekagram).

c. Importance of the Decimal Point. The placement of the decimal point in the metric system indicates the decimal progression by tens, hundreds, thousands, etc. In writing the fractional part of a metric unit, a zero is placed before the decimal point to help prevent misreading the decimal fraction, which could be very dangerous when working with drugs. Table 4–4 shows

Table 4–4. Metric Doses With Approximate Apothecary Equivalents

Liquid Measure		Liquid Measure	
Metric	Approximate apothecary equivalents	Metric	Approximate apothecary equivalents
1,000 ml	1 quart	3 ml	45 minims
750 ml	1½ pints	2 ml	30 minims
500 ml	1 pint	1 ml	15 minims
250 ml	8 fluid ounces	0.75 ml	12 minims
200 ml	7 fluid ounces	0.6 ml	10 minims
100 ml	3½ fluid ounces	0.5 ml	8 minims
50 ml	1¾ fluid ounces	0.3 ml	5 minims
30 ml	1 fluid ounce	0.25 ml	4 minims
15 ml	4 fluid drams	0.2 ml	3 minims
10 ml	2½ fluid drams	0.1 ml	1½ minims
8 ml	2 fluid drams	0.06 ml	1 minim
5 ml	1¼ fluid drams	0.05 ml	¾ minim
4 ml	1 fluid dram	0.03 ml	½ minim

Weight		Weight	
Metric	Approximate apothecary equivalents	Metric	Approximate apothecary equivalents
30 Gm.	1 ounce	30 mg	1/2 grain
15 Gm.	4 drams	25 mg.	3/8 grain
10 Gm.	2½ drams	20 mg	1/3 grain
7.5 Gm.	2 drams	15 mg	1/4 grain
6 Gm.	90 grains	12 mg	1/5 grain
5 Gm.	75 grains	10 mg	1/6 grain
4 Gm.	60 grains (1 dram)	8 mg	1/8 grain
3 Gm.	45 grains	6 mg	1/10 grain
2 Gm.	30 grains (½ dram)	5 mg	1/12 grain
1.5 Gm.	22 grains	4 mg	1/15 grain
1 Gm.	15 grains	3 mg	1/20 grain
0.75 Gm.	12 grains	2 mg	1/30 grain
0.6 Gm.	10 grains	1.5 mg	1/40 grain
0.5 Gm.	7½ grains	1.2 mg	1/50 grain
0.4 Gm.	6 grains	1 mg	1/60 grain
0.3 Gm.	5 grains	0.8 mg	1/80 grain
0.25 Gm.	4 grains	0.6 mg	1/100 grain
0.2 Gm.	3 grains	0.5 mg	1/120 grain
0.15 Gm.	2½ grains	0.4 mg	1/150 grain
0.12 Gm.	2 grains	0.3 mg	1/200 grain
0.1 Gm.	1½ grains	0.25 mg	1/250 grain
75 mg.	1¼ grains	0.2 mg	1/300 grain
60 mg.	1 grain	0.15 mg	1/400 grain
50 mg.	¾ grain	0.12 mg	1/500 grain
40 mg.	⅔ grain	0.1 mg	1/600 grain

NOTE

A milliliter (ml.) is the approximate equivalent of a cubic centimeter (cc.)
The above approximate dose equivalents have been adopted by the latest *Pharmacopeia, National Formulary,* and *New Drugs,* and these dose equivalents have the approval of the Federal Food and Drug Administration.

that fractional parts of metric units are preceded by zero.

4–10. Converting Between Units in the Metric System

As a general rule, drug quantities less than 0.1 Gm. are expressed as milligrams; quantities more than 0.1 Gm. are expressed as grams.

a. Grams to Milligrams. To convert grams to milligrams, move the decimal point three places to the right (multiply by 1000). *Examples*: 0.075 Gm. = 75 mg.; 0.25 Gm. = 250 mg.

b. Milligrams to Grams. To convert milligrams to grams, move the decimal point 3 places to the left (divide by 1000). *Examples*: 1000 mg. = 1 Gm.; 500 mg. = 0.5 Gm.

4–11. Converting Measurements From Apothecary to Metric

On those occasions when an apothecary measurement must be converted to a metric measurement and there is no conversion table available for referral, it is essential to know how to convert the necessary measurements by calculation.

a. To convert grains to milligrams, multiply grains by 60 to obtain milligrams. *Example*: How many milligrams in ¼ grain of morphine sulphate?

$$1/4 \times 60 = \frac{60}{4} = 15 \quad \text{Answer: 15 mg.}$$

b. To convert fluid ounces to milliliters, multiply by 30. *Example*: How many milliliters in 10 fluid ounces of water?

$$10 \times 30 = 300 \quad \text{Answers: 300 ml.}$$

c. To convert minims to milliliters, divide minims by 15. *Example*: How many milliliters in 10 minims of solution?

$$15\overline{)10.00} \quad .66 \quad \text{Answer: 0.66 ml.}$$

4–12. Calculation of Doses From Tablets or Capsules

If the dose to be given does not correspond with the dose indicated on the drug container label, it is necessary to calculate how many tablets or capsules available will contain the required dose. The rule to be used is—Divide the desired dose by the dose on hand to determine the number of tablets or capsules required.

a. Example 1. The order is written to give tetracycline hydrochloride 0.5 Gm. The label on the drug container reads, "tetracycline hydrochloride 0.25 Gm."

$\frac{0.50}{0.25} = 2$ Answer: Give 2 capsules, each containing 0.25 Gm.

b. Example 2. The order is written to give tetracycline hydrochloride 500 mg. The label on the drug container reads, "tetracycline hydrochloride 0.25 Gm." An additional step is needed in this example; since the order is written in milligrams, grams must be converted to milligrams.

Step 1: Convert grams to milligrams. 0.25 = 250 mg.

Step 2: $\frac{500}{250} = 2$ Answer: Give 2 capsules, each containing 0.25 Gm.

4–13. Calculation of Doses From Drugs in Solution

Drugs for injection are usually dispensed as sterile solutions in sealed, single-dose glass ampules or in rubber-stoppered, multiple-dose vials. The strength of the solution is written on the label of the drug container; for example, "10 mg. per ml." The problem is to determine what quantity of the solution available contains the dose of drug required. The rule to be used for this type of problem is: amount of drug is to finished solution as the ratio of strength. The method for solving the problem is by ratio and proportion.

a. Example 1. A solution of diphenhydramine hydrochloride contains 10 mg. per ml. The dose to be given is 5 mg.

Amount of drug : finished solution : : ratio of strength

5 mg. : X ml. : : 10 mg. : 1 ml.

5 mg. : X ml. : : 10 mg. : 1 ml.

$10X = 5$

$X = \frac{5}{10} = 0.5$ ml.

Answer: Give 0.5 ml. of solution, which contains 5 mg. diphenhydramine hydrochloride.

b. Example 2. A solution of chlorpromazine hydrochloride contains 25 mg. per ml. The dose to be given is 0.025 Gm.

Step 1. Change grams to milligrams — 0.025 Gm. = 25 mg.

Step 2. Amount of drug: finished solution : : ratio of strength

25 ml. : X ml. : : 25 mg. : 1 ml.

$25X = 25$

$X = 1$ ml.

Answer: Give 1 ml. of solution which contains 25 mg. of chlorpromazine hydrochloride.

Section III. ACTIONS AND CLASSIFICATIONS OF DRUGS

4-14. Actions of Drugs

Drugs act by increasing or decreasing the actions or functions of body cells. Stimulation results in increased cell activity. Depression results in decreased cell activity. Drugs which act at the site of application on the skin or mucous membrane have a local action. Drugs which act after absorption into the blood stream and distribution to all parts of the body have a systemic action. It is important to realize that some drugs applied externally to the skin or mucous membrane (such as nose drops containing phenylephrine) are absorbed and have both a local and a systemic action; others, although taken internally (such as aluminum hydroxide), have a local action because they are not absorbed from the mucous membrane of the gastrointestinal tract.

4-15. Major Classifications

Drugs are classified or grouped in several different ways. One major classification is by therapeutic action; that is, by the action of drugs on the body in the treatment of disease. Another major classification of drugs is by the system of the body on which they have their effect. These two groupings are often combined, because drugs seldom affect a single body organ or system. Drugs can, and do, cause both desired effects and undesirable side effects in one or more body organs and body systems. Being aware that drugs produce both desirable and undesirable actions is essential to anyone who dispenses or administers drugs.

4-16. Classification by Therapeutic Action

In this major classification, drugs are grouped according to the effect they produce on the body to bring about a desired therapeutic result (as in the case of vasoconstrictors and diuretics), or according to the effect they produce on the pathogenic organism or the signs and symptoms of the disease (as in the case of fungicides, analgesics, and antipyretics).

a. Analgesics. These drugs are used to relieve pain without loss of consciousness. Aspirin is a mild analgesic. For relief of severe pain, morphine, an opium derivative, is the most valuable analgesic.

b. Anesthetics. These drugs are used to produce either a general or a local loss of sensation. An example of a general anesthetic is ether, which on inhalation, produces a loss of consciousness. An example of a local anesthetic is procaine hydrochloride, which on injection by special technique, produces local analgesia.

c. Antacids. Antacids are given to neutralize excess acid in the stomach. An example of an antacid is aluminum hydroxide.

d. Anthelmintics. These are drugs used to rid the body of worms (helminths). An example is piperazine citrate syrup.

e. Antiemetics. These are drugs used to relieve nausea and vomiting. An example is promazine hydrochloride.

f. Antibiotics. Drugs which inhibit the growth of or destroy bacteria and other microorganisms. An example is penicillin.

g. Sulfonamides. Drugs which inhibit the growth of or destroy bacteria, particularly the coccus form. One example is sulfisoxazole.

h. Antimalarials (Plasmodicides). Drugs which prevent or cure malaria; *for example,* chloriquine phosphate.

i. Anti-Inflammatories. These drugs suppress local inflammatory reactions. An example is hydrocortisone ointment, 1 percent, used for some eye inflammatory conditions (ophthalmia).

j. Antifungals. These are drugs which check the growth of fungi. An example for external use (local application) is fungicidal foot powder. A recently developed antibiotic drug for oral administration in systemic treatment of fungus diseases of the skin is griseofulvin.

k. Antihistamines. These are drugs which counteract the effects of histamine. The release of abnormal amounts of histamine into body tissues is associated with acute allergic and hypersensitivity reactions. An example of an antihistamine is diphenhydramine hydrochloride.

l. Antiparasitics. Antiparasitics are used to eliminate skin infestation with mites. Examples for external use are gamma benzene hydrochloride ointment or lotion.

m. Antipyretics. These are drugs used to reduce the temperature during a fever. (They do NOT affect normal body temperature.) An example is aspirin.

n. Antiseptics and Germicides.

(1) Antiseptics are chemical agents that inhibit the growth and development of microorgan-

isms. They may be applied to living tissue. An example is benzethonium chloride solution 1:1000.

(2) Germicides are chemical agents which are capable of destroying organisms (not necessarily spores). They may be applied both to living tissue and to inanimate objects for purposes of disinfection. An example is detergent iodine solution (iodophors).

o. Astringents. These are drugs which produce shrinkage of the skin or mucous membrane and cause a decrease in secretions. Astringents help to protect tissue from irritating substances. An example is zinc oxide ointment.

p. Cathartics. Cathartics are drugs which quicken and increase evacuation of the bowels. A laxative is a mild cathartic; a purgative is a stronger or more drastic cathartic. Dosage is frequently the determining factor in whether a cathartic will have a laxative or a purgative action. An example of a laxative is senna pod extract tablets.

q. Counterirritants. These are drugs which cause irritation of the skin, thus increasing circulation and relieving inflammation in the structures beneath the skin. Liniments are counterirritants. An example of a drug with counterirritant action is methyl salicylate (oil of wintergreen).

r. Diuretics. These drugs are used to increase the production of urine. An example is acetazolamide.

s. Emollients and Protectives. These are drug preparations used on the skin and mucous membrane for a soothing effect.

(1) Emollients are fatty preparations that soften the skin. An example is cold cream.

(2) Protectives are preparations that form a film on the skin. An example is compound tincture of benzoin.

t. Inhalants. These are drugs which are inhaled and absorbed through the lungs. An example is aromatic spirits of ammonia.

u. Sedatives, Tranquilizers, and Hypnotics.

(1) Sedatives are drugs which have a calming, quieting effect and, in large doses, induce sleep. An example is phenobarbital.

(2) Tranquilizers are drugs that have a sedative effect that is characterized by relief of neuromuscular tension and anxiety without producing sleep. An example is chlorpromazine hydrochloride.

(3) Hynotics are drugs that induce sleep. Many drugs that have a sedative effect in small doses have a hypnotic effect when given in larger doses; for example, phenobarbital.

v. Stimulants. Stimulants are drugs which cause an increase in the activity of an organ or a system. Caffeine, a central nervous system stimulant, decreases drowsiness and fatigue. Digitalis, a heart stimulant, strengthens heart muscle contraction.

w. Vasoconstrictors. These are drugs which constrict the walls of blood vessels, particularly peripheral vessels. Epinephrine is an example of a powerful systemic vasoconstrictor.

4-17. Classification by Systemic Action

This major classification groups drugs according to the body systems that they affect. They may be applied directly to the system they are to affect (as in the case of antacids that are administered directly into the gastrointestinal tract to relieve a condition in the digestive system), or they may be administered via one system and affect another (as in the case of a heart stimulant that is administered orally).

a. Skin and Mucous Membranes. The drugs, usually applied locally, that affect the skin or mucous membranes are antiseptics, local anesthetics, counterirritants, antifungals, antiparasitics, and local vasoconstrictors.

b. Gastrointestinal Tract. Antacids and cathartics are among the drugs used to exert their main action on the digestive system. Some drugs used for specific gastrointestinal disorders act through the autonomic nervous system and have a therapeutic effect by decreasing smooth muscle movement and gastric acid secretion.

c. Respiratory Tract. The drugs that affect respiration include inhalants, stimulants, expectorants, and depressants.

d. Heart and Blood Vessels. Heart stimulants, vasodilators, and vasoconstrictors are among the drugs that affect this system.

e. Nervous System. Drugs classified as analgesics, anesthetics, narcotics, hypnotics, sedatives, and tranquilizers act on the central nervous system.

Section IV. ADMINISTRATION OF DRUGS

4-18. General

Administration of drugs and medicines deals with the various ways by which they are applied to the body for local effect, or introduced into the body for systemic or for general effect. Some drugs may be used either way.

4-19. External Administration

Topical (external) application of a drug is usually made for the local effect it will have on the skin or mucous membrane of a circumscribed area. Sometimes such an application is made for its effect in underlying tissues. The preparations most commonly used are—

a. Solutions. These are applied locally as antiseptics, cleaning agents, astringents, vasoconstrictors, counterirritants, or emollients (soothing agents). Solutions are also used as wet dressings, mouthwashes, gargles, irrigations, and soaks. Since solutions evaporate, the effect produced is often temporary.

b. Ointments. These provide a means of applying drugs for a prolonged local effect. The drug is mixed in a fatty material such as lard, petrolatum, or lanolin, which becomes soft or liquid when warm but does not evaporate. Thus the drug is kept in contact with the body for a long period. Ointments are not used on discharging wounds because they prevent free drainage.

c. Suppositories. These are used for insertion into a body cavity; *for example,* in the rectum, urethra, or vagina. The drug is mixed with a solid inert base which melts at body temperature. The mixture is shaped into a cone or cylinder which can be easily inserted. An example of a suppository base is cocoa butter. After the base melts in the cavity, the active drug comes in contact with the mucous membrane of the cavity. If the nature of the drug is such that it is absorbed through the membrane, a systemic effect may be produced. An example of a drug which produces a systemic effect when administered as a rectal suppository is aspirin.

4-20. Internal Administration

Drugs may be given internally by several methods. When they are so given, the effect may be upon the whole body, or in one of the systems, or only at the site where the drug is administered. The common methods of internal administration are—

a. Oral. The most common way to give a medicine is by mouth, either in solid or liquid form. Giving a drug by mouth is the simplest way; it requires no special apparatus; it is painless; and absorption takes place in a natural manner. Furthermore, if a patient is sensitive to the drug, the stomach can be washed out or the patient induced to vomit so as to prevent further absorption.

b. Sublingual. A limited number of drugs are administered by placing a tablet or drop under the tongue. The drug is held there until absorbed. It is not swallowed, and a drink must not be taken until absorption has taken place. The action of drugs given this way is rapid. (The drug most commonly used sublingually is nitroglycerine.)

c. Rectal. Medications are given by rectum for the purpose of evacuating the colon, for local treatment of a diseased rectum or colon, and for general absorption. To induce a bowel movement, drugs may be given by an enema. Irrigations may be used to medicate the mucous membrane of the rectum or colon. Rectal suppositories also are frequently used. Another method by which substances are administered through the rectum is proctoclysis. Fluid is allowed to run into the rectum slowly, drop by drop, so that it is absorbed and does not enlarge the rectum. The disadvantages of rectal administration are the uncertainty of absorption and the chance that the drug may be expelled.

d. Inhalation. Medications are administered by inhaling them into the lungs. This may be done by inhalation of aqueous preparations such as medicated steam, sprays, and aerosols. Drugs given by inhalation include various preparations for respiratory infections and diseases, medicinal gases such as oxygen, and certain general anesthetics. Oily preparations are not given by inhalation since the oil would damage lung tissue.

e. Injection. Drugs given by injection are administered with a sterile needle and syringe; injection methods are also referred to as parenteral (beside the intestine). A sterile injection method is used when rapid action by the drug is desired, when the drug might be destroyed by digestive juices or vomited if given by mouth, or when the patient is unconscious or injured so that he cannot be given the medication by mouth.

(1) *Subcutaneous (hypodermic).* The drug is injected by syringe and needle into the tissue just beneath the skin. A preparation for subcutaneous use must be a sterile liquid capable of complete absorption or it will irritate the tissues. Although the subcutanous injection may be given in almost any area of the body, the usual sites are the lateral (outer) aspect of the upper arms and the anterior (front) of the thighs.

(2) *Intramuscular.* The drug is injected into a muscle, usually in the buttocks, sometimes in the upper arm or the thigh. The needle is inserted, at right angle to the skin, through the skin and subcutaneous tissue into the underlying muscle. This method gives more rapid absorption of the drug than subcutaneous injection gives.

(3) *Intravenous.* Drugs administered by vein act very rapidly, because the whole dose passes directly into the blood stream. A comparatively small amount of sterile solution is given by intravenous injection; large amounts, administered drop by drop, are given by intravenous infusion. The usual site of injection is into the median basilic or median cephalic vein at the bend of the elbow. Intravenous injection is used when the drug is too irritating to be injected into other tissues, when immediate action is necessary, or when circulation is so poor that absorption from other tissue would be retarded. The IV administration of drugs is the responsibility of a medical officer; it is not a routine procedure performed by nurses or nonprofessional nursing personnel. When so performed, it must be in accordance with local policy directives.

(4) *Intradermal.* The drug is injected into the upper layers of skin, rather than under the skin as in a subcutaneous injection. Minuté amounts (0.1 ml. and less) are given intradermally, usually to test for drug sensitivity before administering larger amounts by other methods. Absorption from intradermal injection is slow. The medial (inner) surface of the forearm is the site most frequently used.

(5) *Intraspinal (intrathecal).* Drugs injected into the spinal canal are usually injected into the subarachnoid space. Some anti-infective drugs as well as spinal anesthesia are administered in this manner. The technique is the same as that required for lumbar puncture. The administration of drugs in this manner is the responsibility of the medical officer.

(6) *Other.* Drugs may also be injected into the peritoneum (intraperitoneal), into the heart muscle (intracardiac), into bone (intraosseous), and joints (intrasynovial). All of these procedures are carried out by a medical officer.

4-21. Factors Influencing Dosage and Actions of Drugs

Experience has shown that people usually react to similar drugs in similar ways. The responsibility of prescribing the dosage of drugs rests with the medical officer. Dosage is the determination and regulation of doses. Dose is the quantity of drug to be given at one time. The individual responsible for administering the dose prescribed should be informed about factors considered by the doctor when the drug is ordered. Important factors are summarized as follows:

a. Primary Factors. These include the drug, the dose, the patient, and the judgment of the medical officer prescribing the drug.

(1) *The drug.* The potency of a drug may be altered by the age of the drug; its form; or the way in which it is administered.

(2) *The dose.* A minimal dose may be prescribed. This is the smallest amount of drug that will produce a therapeutic effect. A maximal dose is the largest amount of drug that will produce the desired effect without accompanying symptoms of toxicity.

(3) *The patient.* The body weight, sex, age, and physical or emotional condition of the patient may affect the action of a drug. In general, a heavy person requires more of a drug than a small person. When a definite concentration of drug in the blood is desired, the dosage is frequently determined by computing the amount of drug per kilogram of body weight. Dosage of drugs for pregnant women is an important factor that must be taken into consideration because of the possible effect on the fetus. Old people and children usually require less than the usual dosage of a drug. Pediatric dosage forms containing suitably reduced concentrations of drug may be specified by the physician as the dosage form to be administered.

(4) *Judgment.* The written order for a drug is based on the medical officer's judgment of what is required for a specific patient and the order may not be altered by the individual who is to administer the drug. If the drug ordered is not available or, if available, is not in the form required for administration, the medical officer must be informed and a new order obtained.

b. Other Factors. Other factors that are considered by the medical officer in determining the dosage are—

(1) *Idiosyncrasy.* An unusual reaction to a drug which is different from its characteristic pharmacological action. An example of idiosyncrasy would be excitement or restlessness after receiving a drug that normally produces relaxation or sleep.

(2) *Hypersensitivity.* A patient with this response is allergic to the drug or the vehicle in which it is incorporated. The tissues react in hypersensitivity with symptoms ranging from itching, skin rash, or hives, to respiratory difficulty and shock (circulatory collapse).

(3) *Side reaction.* A drug given for a certain effect may have other effects, sometimes undesirable. These other effects are called side reactions. *For example,* morphine acts with desirable effect when given to relieve severe pain but causes an undesirable side effect by depressing respiration.

(4) *Tolerance.* This is a lack of reaction to a drug, usually resulting from prolonged use of the drug. If this occurs, the dose must be progressively increased to get a desired effect. Tolerance may be acquired for morphine, barbiturates, and numerous other drugs.

(5) *Antagonistic action.* Drugs that have an opposite effect to other drugs are antagonistic. Such drugs can be very useful in counteracting undesired effects as in the case of poisoning. An example is levallorphan tartrate, an antagonist to morphine sulphate.

(6) *Cumulative effect.* Sometimes, after numerous doses, a drug accumulates, or builds up, in the body and continues to produce effects. This is due to the inability of the body to dispose of the drug as rapidly as it is being given. A drug which has this stockpiling effect is digitalis.

(7) *Habituation.* This is emotional dependence upon a drug. Barbiturates are among the drugs whose prolonged use can produce habituation.

(8) *Addiction.* Addiction is a condition developed in man in which continued use of a drug is necessary for the body to function normally. In addiction there is usually tolerance as well, so relatively huge doses of the drug to which addicted must be taken to obtain the drug effect. Among the drugs which may produce addiction are morphine and other opium derivatives and drugs described by law as narcotics.

4–22. Responsibility of the Medical Specialist in Drug Administration

Although it is the responsibility of the doctor to prescribe the medication, it is the specialist's responsibility to follow orders intelligently and with a constant awareness of variations which occur in procedures for pouring and administering drugs and in reactions of patients to drugs. The specialist must comply with several basic rules when he is assigned to administer drugs. He must be sure that he has the right drug for the right patient. He must be familiar with the drug prescribed and must not hesitate to check with a nurse, doctor, or pharmacist if he has any doubt as to the nature of the prescribed medication. He must use proper techniques in pouring and preparing drugs which he will administer. He must administer the drug exactly as ordered by the doctor. He must remain with the patient until the medication has been swallowed if it is an oral medication (with one exception: step 9, table 4–5). He must always record the medication on the patient's medical record in accordance with local policy. He must observe the patient closely for any signs of unfavorable reactions and report them at once to the nurse or doctor.

4–23. Use of Medicine Cards

Medicine cards are standard forms (DA Form 8–244) on which the medical officer's written orders for medication are transferred. An individual card is made out for each prescribed medication to be given on a repetitive basis. On each card is written the patient's full name, room, bed number, drug, dose, time to be given, and date and hour for starting and stopping the drug. When medicine cards are used, the doctor's orders must be reviewed and the information on the cards checked against the written order at least once every 8 hours as a means of insuring that current information has been transcribed correctly. If the frequency of administering a drug is changed, a new medical card must be made.

a. Filing. Medication cards are kept in a compartmented file, according to the hours of administration. At the time medications are prepared, the cards for that hour of administration are removed from the file. All cards for an individual patient are stacked together face up. As each individual medication is poured, the container (glass or paper cup) into which the medication is placed is identified by the card. If used with a medicine cart, the card is placed in the slot provided in

Table 4-5. General Rules for Preparation and Administration of Medications by Any Method

DO—	DO NOT—
1. Have written order from the doctor for all medications.	**Caution:** Do not allow any distraction such as conversation while preparing and administering medication of any kind at any time.
2. When medicine cards are used:	
a. Make certain that the data on the card corresponds exactly with the doctor's written order.	
b. Identify each medication prepared with a separate medicine card.	
3. Know how drugs act; whether a local or systemic effect is desired and what possible bad effects might occur.	• Do not give a drug with which your are unfamiliar.
4. Wash hands immediately before preparing medication.	
5. Read the drug container label three times when preparing a medication. Make this a deliberate procedure, checking the drug label against the order or the medicine card each time.	• Do not use drugs from unlabeled containers or from a container whose label is not legible.
a. Before taking container from shelf.	
b. Before removing drug from the container.	
c. Before returning the container to its proper place.	
6. Measure the dose accurately. If liquid, measure at eye level. If calculation is necessary, recheck calculation. If any doubt exists, verify by checking with some responsible person—nurse, doctor, pharmacist.	• Do not give drugs that have been poured by some other person. • Do not return any excess drug to the container.
7. Request that all ambulatory patients remain at their bedsides, as medication will be brought to them.	
8. Identify the patient by calling him by name. If there is any doubt, ask patient to state his name or check his identification band.	• Do not rely on room, bed number, or name on bedcard to identify patient.
9. Remain with the patient until oral medication has been swallowed. EXCEPTION: If a written order requires medication at the bedside, record the order on the medication card. At time of administration:	• Do not leave a medication at bedside.
a. Check supply of drug at bedside.	
b. Verify by requesting patient to repeat doctor's instructions.	
10. Use memo pad and pencil for on-the-spot observations.	• Do not rely on memory for important observations.

front of the container; if used with a medicine tray, the card is placed under the cup or glass containing the medication. Card and medications are carried to the patient's bedside, and after drugs are administered, the card is filed according to the next hour of administration. When the drug is discontinued, the card is destroyed.

b. P.R.N. Orders. Make out a card for each p.r.n. order. In addition to using the card for identification of the drug while it is being prepared and administered, always check the Nursing Notes for notation on the last administration of a p.r.n. drug before giving it again. A p.r.n. order must always indicate the frequency with which the dose may be repeated. Local policy may dictate that an automatic stop order be put on all p.r.n. drug orders.

c. Special Orders. Stat. orders and other single-dose orders should be transferred to a card for safe identification while the drug is being prepared and administered. This card is destroyed after use.

4-24. General Rules for Preparation and Administration of Medication by Any Methods

General rules for preparation and administration of medications by any method are summarized in table form for ready reference (table 4-5).

4-25. Preparation and Administration of Oral Medications

a. Observe carefully the general rules listed in table 4-5.

b. Check equipment required. This will include the following: medicine cards, tray or medicine cart, medicine glasses or calibrated paper cups, dropper, graduate calibrated in minims or dropper calibrated in minims, pitcher of water, paper cups for water, drinking tubes, tongue blade or glass stirring rod, paper tissues, paper towels, memo pad, pencil, watch with second hand.

c. Prepare as follows:

(1) *Pills, tablets, and capsules.* Shake required number into container cap and transfer to medicine glass or cup.

(2) *Liquid medications poured from bottle.*

(*a*) Place cap upside down on shelf or table. Now hold medicine glass so that the calibration mark of the prescribed amount is eye level (fig. 4-2) and place thumbnail on this mark.

NOTE

When liquid is poured into a cylinder, surface forces cause its surface to

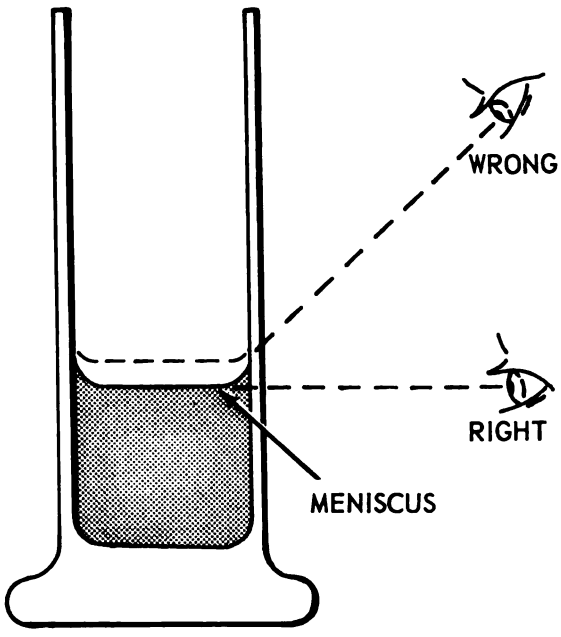


Figure 4–2. Technique for measuring liquids.

become concave; that is, that portion in contact with the cylinder is drawn upward. This is known as a meniscus (fig. 4–2) and in determining the volume of liquid, the reading must be made at the bottom of the meniscus. This can be done by holding the container up so that the level of liquid is at the line of sight or, with heavy objects, lowering the body until the line of sight is even with the level of liquid.

(*b*) Hold bottle label next to palm of hand, and pour from side opposite label so that if a drop runs down outside of bottle it will not obscure the label. Wipe neck of bottle with a damp paper towel before replacing cap.

(*c*) Dilute poured medication, unless contraindicated, with about 15 ml. water.

(3) *Liquid medication measured in drops.* Draw up approximate amount of solution into dropper. Count aloud the prescribed number of drops into the medicine glass. Discard solution remaining in the dropper. Dilute measured drops with 15 ml. water, unless counterindicated.

(4) *Liquid medication measured in minims.* Use minim-calibrated dropper or minim-calibrated graduate when medication order requires minim measurement. A minim and a drop are not equivalent measures.

(5) *Powders and granules.* Measure required amount into glass or cup, but do not add water until at bedside. At this time, add water and stir. Rinse glass with small additional amount of water to remove all residual drug and give this to the patient also.

(6) *Cough syrups.* Do not dilute with water. Have patient drink water before taking medication and instruct him not to drink for 15 minutes after taking medication.

(7) *Sublingual medications.* If sublingual (under the tongue) medications are to be used, give no water and instruct the patient not to swallow saliva until the taste of the drug has disappeared. These medications dissolve rapidly and are absorbed rapidly through the oral mucous membrane; they are less effective if swallowed.

(8) *Troche or lozenge.* If a troche or lozenge is given, tell the patient to hold it in his mouth and let it dissolve slowly. There will be a relatively high concentration of drug in the mouth and in the swallowed saliva; this effect is desirable.

(9) *Drugs with special requirements prior to administration.* When a drug such as digitalis is given which requires that the pulse be taken before administering the drug, write down the patient's name, the time, and the apical pulse rate immediately before giving the drug.

4–26. General Procedures for Preparing Medication for Injection

Use aseptic technique in preparing and administering medication by injection. Since the skin is punctured, take every precaution to prevent the introduction of pathogenic organisms into the wound.

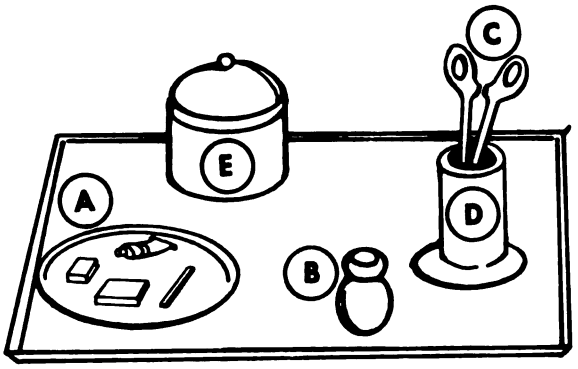
a. Follow general rules in table 4–5.

b. Prepare prescribed injection, following the steps listed.

(1) Check hypodermic tray (figs. 4–3, 4–4, 4–5) for the following equipment: a supply of foil-wrapped germicide wipes or a sterile container of 70-percent alcohol sponges; individual sterile-wrapped syringe and correct-size needle (use sealed, disposable syringes and needles when available); emergency drugs; ampule file; and waste receptacle.

NOTE

Emergency drugs are kept outside the locked medicine cabinet for immediate accessibility. If any item is used, it must be replaced immediately. Examples of drugs found in an emergency drug container are epinephrine 1–1000; diphen-



(A) CONTAINER:
VIALS, EMERGENCY DRUGS, FILE

(B) STERILE DISTILLED WATER VIAL

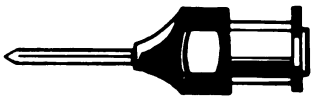
(C) STERILE TRANSFER FORCEPS

(D) CONTAINER, TRANSFER FORCEPS

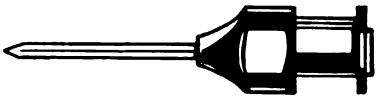
(E) CONTAINER, SPONGES IN GERMICIDE

Figure 4–3. Hypodermic tray.

NEEDLES FOR INJECTION



INTRADERMAL – 25 GAGE X 1/2 INCH LENGTH



SUBCUTANEOUS – 23 GAGE X 3/4 INCH LENGTH

INTRAMUSCULAR –
FOR DELTOID – 23 X 3/4 INCH LENGTH
FOR BUTTOCK – 21 X 1 1/4 INCH LENGTH

Figure 4–4. Types of needles.

hydramine hydrochloride, 10 mg. per 1 ml.; and aromatic spirits of ammonia in crush-type ampule.

(2) Prepare the syringe and needle. Assemble the syringe, when necessary, being careful not to touch the needle shaft, the tip of the syringe, the inner part of the barrel, or the shaft of the plunger. If the needle is in a protective plastic sheath or envelope, open at the hub end and fit the syringe tip into the needle hub before removing the needle from its sterile wrapper. Save the sheath or tube to protect the shaft of the needle.

(3) Withdraw medication in accordance with table 4–6. Protect needle when carrying to bedside by replacing the sterile sheath.

(4) Place prepared syringe, medicine card, and alcohol sponges for skin cleansing on a small tray to take to patient. Both hands are usually required to assist the patient. It is not a safe practice to place the prepared syringe on the bedside tabletop.

c. Use of cartridge-needle unit for injections. Cartridge-needle units (Tubex) are single-dose containers of prescription medication prepared in a sterile assembly with attached needle. Units available as standard items include cartridge-needle units of penicillin and cartridge-needle units of epinephrine 1–1000 solution. When calibrated cartridges are supplied, it is possible to administer fractional doses of medication. The units intended for intramuscular injection are preassembled by the manufacturer with a 20-gage, 1¼-inch needle; the units intended for subcutaneous injection are preassembled by the manufacturer with a 25-gage, ⅝-inch needle attached. To maintain sterility, leave the plastic needle sheath in place until just before use. The method of administration is the same as with the conventional syringe. The cartridge-needle unit is customarily used with a plastic syringe provided by the manufacturer. As

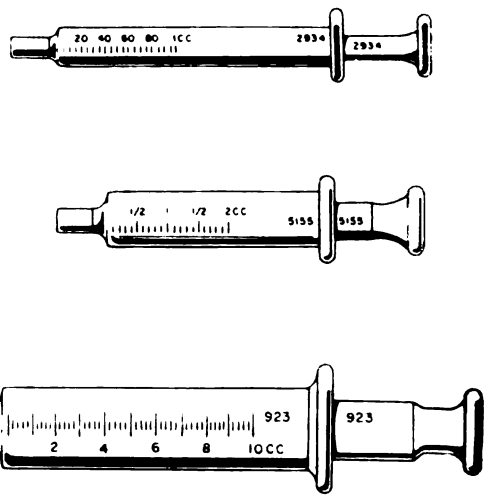
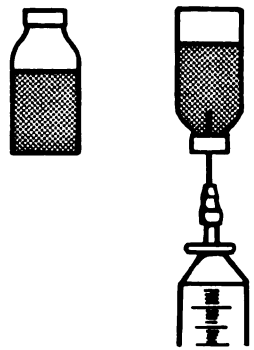


Figure 4–5. Types of syringes.

Table 4–6. Preparation of Medication for Needle Injection
(Always check drug container label 3 times)

MEDICATION FROM STOPPERED VIAL



1. Cleanse stopper with sterile germicide wipe or alcohol sponge.
2. Draw back plunger of syringe to the calibration of the amount of solution desired. Allow for withdrawal of slightly more solution (about 0.1 ml.) than to be administered.
3. Insert needle through center of stopper. Push in plunger to inject air.
4. Invert vial; pull back on plunger; withdraw desired amount; remove needle.
5. Hold the needle tip upright.
6. Eject any air by gently pushing until drop of solution appears at needle tip. Retain about 0.1 ml. more than required.
7. Cover needle with sheath or protect it by inserting within peeled-back flap of a foil-wrapped germicide wipe. Otherwise, use a dry, sterile 2 by 2 gauze sponge.

MEDICATION IN POWDER FORM FROM STOPPERED VIAL

Medication such as antibiotics are usually packaged in powdered form in a sealed sterile vial. Follow directions on the vial label for the amount of solvent to be added. To place this powder form in solution:

1. Cleanse stopper of the sterile solvent vial (distilled water or normal saline) with alcohol sponge.
2. Withdraw required amount of solvent, using procedure for stopper vial or for ampule.
3. Cleanse stopper of vial containing medication in powder form with alcohol sponge.
4. Insert needle through stopper of powder vial; inject the solvent into this vial. Keeping needle inserted, gently agitate the vial until powder is completely dissolved.
5. Withdraw all solution, keeping needle tip immersed in solution.
6. Withdraw needle.
7. Cover needle with sheath or protect it by inserting within peeled-back flap of a foil-wrapped germicide wipe. Otherwise, use a dry, sterile 2 by 2 gauze sponge.

MEDICATION FROM AMPULE

1. Tap medication down from tip of ampule by flicking lightly with fingertips.
2. If ampule has "break line," no file is required. If file must be used:
   - Wipe file and neck of ampule with alcohol sponge.
   - File neck of ampule with 2 or 3 firm strokes on one side of constriction of ampule. Then, cleanse neck of ampule thoroughly with alcohol sponge.
3. Cover ampule with sterile sponge.
4. Inspect contents of ampule twice for minute glass particles by turning vial upside down and back again.
5. Break off neck of ampule by bending back away from file marks.
6. Discard sponge and broken top in waste container.

7. Supporting the ampule between the 1st and 2d fingers of the left hand, tip ampule to 45-degree angle.
8. Insert needle into ampule. DO NOT inject air into ampule.
9. Withdraw desired amount of solution, keeping needle tip immersed in solution.
10. Withdraw needle.
11. Cover needle with sheath or protect it by inserting within peeled-back flap of a foil-wrapped germicide wipe. Otherwise, use a dry, sterile, 2 by 2 gauze sponge.

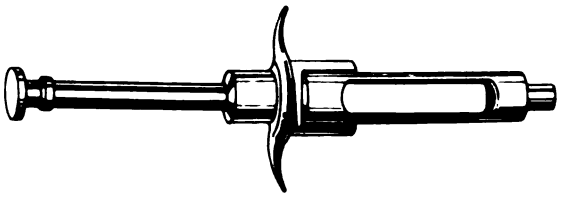


Figure 4-6. Cartridge syringe.

issued by medical supply or the pharmacy, one package usually contains 20 single-dose cartridge units and 1 reusable syringe. Since illustrations for assembling the syringe and cartridge are included on the package by the manufacturer, it is important to refer to the package label and illustration for directions. When a plastic syringe is not provided, the standard cartridge-needle unit may be used with a stock-item medical metal cartridge syringe (fig. 4–6). To assemble the metal syringe and cartridge needle unit, pull out the syringe plunger to its fullest extent, break open the syringe at the hinge joint, and insert the cartridge. Hold the cartridge in the body of the syringe and turn the plunger clockwise to thread the plunger into the stopper of the cartridge. This step is necessary to permit aspiration before injecting.

4–27. Subcutaneous (Hypodermic) Injection Procedure

A subcutaneous method of injection is ordered when a small amount (less than 2 ml.) of a nonirritating solution is required. With this method, the solution is injected into the loose connective tissue just under the skin layers and the fluid injected is then carried by the lymph to the blood stream. If circulation is normal, the full effect of the injected drug is usually felt within 20 to 30 minutes. There will be delayed absorption and, therefore, delayed effect if the patient's circulation is poor.

- *Injection Site.* The sites most frequently selected are the outer aspect of the upper arm or the outer aspect of the thigh. If repeated injections are to be given, record the site used for each injection and rotate each succeeding injection site to reduce irritation. In a subcutaneous injection, the needle is inserted at about a 45-degree angle (fig. 4–7).
- *Preparation of Equipment.* Follow procedure in paragraph 4–26. Use a 2-ml. syringe and a 23-gage, ¾-inch or a 25-gage, ½-inch long needle.

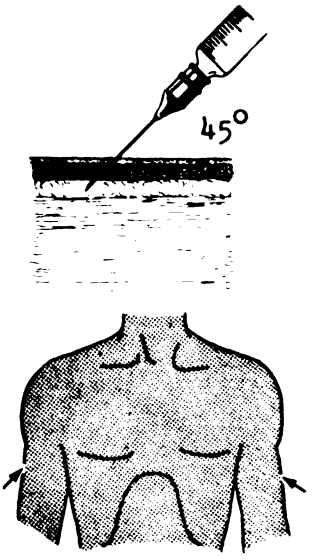


Figure 4-7. Hypodermic injection.

PROCEDURE

1. Take prepared medication on tray to bedside. Place tray on table.
2. Tell patient what is to be done. Position patient comfortably—in bed or sitting in chair. Expose site of injection.
3. Prepare skin at site by applying germicide-saturated sponge in a spiral motion, beginning at center of site and continuing outward until an area about 3 inches in diameter has been cleansed. Retain sponge between the second and third fingers.
4. Pick up syringe and hold upright for a final check of exact dose. Compare dose with medicine card. Expel any air or excess solution.
5. Use thumb and forefinger of free hand to pinch up a cushion of tissue at prepared site.
6. Hold syringe and needle so that bevel of needle is uppermost. Pierce the skin quickly while holding the needle at about a 45-degree angle and insert the needle about ½ inch.
7. Release cushion of tissue held with supportive hand. Use this hand to aspirate.

CAUTION

Do not change hand on syringe.

8. Use the supporting left hand to aspirate. Pull back on plunger slightly. If no blood appears in syringe, press plunger slowly and steadily to inject solution. If blood does appear, withdraw needle. Replace with sterile needle and give injection in another site.

9. Place alcohol sponge at injection site, withdraw needle quickly, and press sponge firmly at injection site. Massage area gently for a few seconds.
10. Put cover on needle and place used syringe and needle on tray. Use care to avoid sticking yourself inadvertently with contaminated needle.
11. Make patient comfortable—help adjust his sleeve and his position as required.
12. Take equipment to workroom. If disposable syringe and needle were used, place sheath on needle to protect fingers, break needle and the tip off the syringe and discard into waste container. If syringe is reusable, rinse it in cold water, separating barrel and plunger. Secure parts together with elastic band and place at collection point for return to CMS.
13. Record medication in Nursing Notes.

4–28. Intramuscular (IM) Injection Procedure

An IM injection method is ordered instead of the subcutaneous method when the drug or the vehicle in which the drug is in solution is irritating, when more rapid absorption is desired, or when there is a larger quantity of fluid than can be readily absorbed by subcutaneous tissue. (Solution in quantity up to 5 ml. may be given deep into heavy muscle tissue. The usual quantity, however, is up to 2.5 ml.)

- *Injection Site.* Choose the site of an IM injection with care, since there is always a risk of striking a nerve, blood vessel, or bone. Although injections of small bulk (0.5 ml. or less) may be given into the deltoid muscle, the injection site of choice for an adult is into the gluteal muscle —in a specially selected area after identification of landmarks. In an IM injection, the needle is inserted at a 90-degree angle (fig. 4–8). If repeated injections are to be given, record the site used for each injection and rotate each succeeding site to reduce irritation.
- *Preparation of Equipment.* Follow procedure in paragraph 4–26. Use a 2- or 5-ml. syringe and a 20- or 21-gage, 1½-inch long needle.

PROCEDURE—DELTOID AREA

1. Take prepared medication on tray to bedside. Place tray on table.
2. Tell patient what is to be done. Position patient comfortably—in bed or sitting in chair. Expose deltoid area by removing garment.

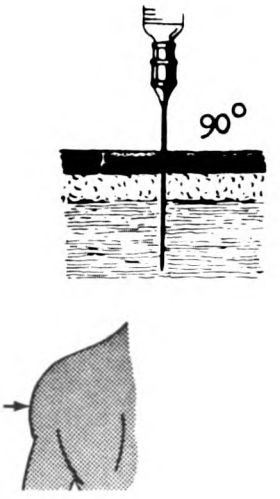


Figure 4–8. Intramuscular injection (deltoid area).

3. Select site, two or three fingerbreadths below tip of shoulder (acromion process). Tell patient to hold his arm loose in order to relax deltoid muscle.
4. Prepare skin at site by applying germicide-saturated sponge in a spiral motion, beginning at center and continuing outward until an area about 3 inches in diameter has been cleansed. Retain sponge between second and third fingers.
5. Pick up syringe and hold upright for a final check of exact dose. Compare dose with medicine card. Expel any air or excess solution.
6. Hold skin and underlying subcutaneous tissue taut by stretching it, using thumb and forefinger of left hand. If arm is fleshy, pull taut from underside. If it is skinny, pinch up as firm a cushion of tissue as possible from the top to avoid hitting bone.
7. Holding syringe and needle at a 90-degree (right) angle to the skin, insert the needle with a quick, firm thrust to penetrate into muscle. Do not insert the needle to the hub. Do NOT use a dart-like motion.
8. Release tissue held with supporting hand. Use this hand to aspirate.
9. Use supporting left hand to aspirate. If no blood appears in syringe, press plunger slowly and steadily to inject solution. If blood does appear, withdraw needle. Replace with sterile needle and give injection in another site.
10. Place alcohol sponge at injection site, withdraw needle quickly, and press sponge firmly

on site. Unless directions on the drug vial stipulate "no massage," massage the injection area gently but firmly, to include underlying muscle, for 5 seconds.

11. Put cover on needle and place used syringe and needle on tray. Use care to avoid sticking yourself inadvertently with contaminated needle.
12. Make patient comfortable—help adjust garment and position as required.
13. Take equipment to workroom and follow procedure in step 12, paragraph 4–27.
14. Record medication in Nursing Notes.

PROCEDURE—GLUTEAL AREA

1. Take prepared medication on tray to bedside. Place tray on bedside table.
2. Tell patient what is to be done. Assist him to prone position in bed. Screen bed and expose buttocks completely. Instruct patient to turn head sideways away from you, to keep hands above shoulder level, and to turn toes in to relax muscles.
3. Select site for injection in designated buttock by using your fingers to identify two landmarks: the posterior superior iliac spine and the greater trochanter of the femur. Then mentally draw a diagonal line between these 2 points. The most fleshy, muscle area above and to one side of this line (lines a and b in fig. 4–9) is the desired site for injection. This method is the preferred one for selecting an appropriate anatomic site in the upper outer quadrant area of the buttock.
4. Follow steps 4 through 14 of deltoid area injection above.

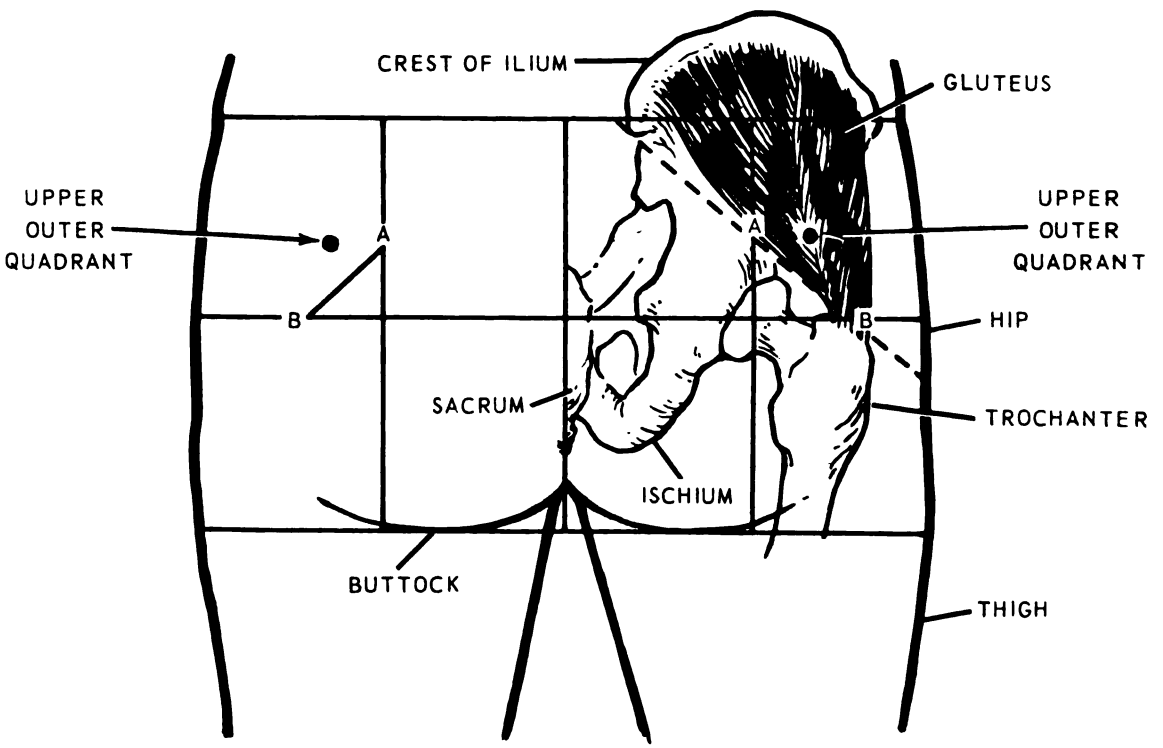


Figure 4–9. Site for intramuscular injection (gluteal area).

4–29. Intradermal Injection Procedure

An intradermal injection is ordered when the solution is to be introduced between skin layers. This method may be used to administer a minute quantity (less than 0.5 ml.) of an immunizing agent such as a booster injection for typhoid immunization. In special clinical procedures, the intradermal injection method is used in skin testing to determine sensitivity to drugs, sera, or other allergens.

- *Injection Site.* Choose the palmar (inner) surface of the forearm, unless otherwise specified. In an intradermal injection, the skin is drawn taut and the needle tip is inserted at as flat an angle to the skin as possible, about 15 degrees (fig. 4–10).
- *Preparation of Equipment.* Follow procedure in paragraph 4–26, but use a colorless germicide such as benzalkonium chloride. Alcohol may inactivate certain allergens. Use a tuberculin (1 ml.) syringe and a 26-gage, ¼-inch long needle. The fineness and sharpness of the needle is essential.

PROCEDURE

1. Take prepared medication on tray to bedside. Place tray on table.
2. Tell patient what is to be done. Position patient comfortably, with selected forearm supported on bed or table. Expose forearm.

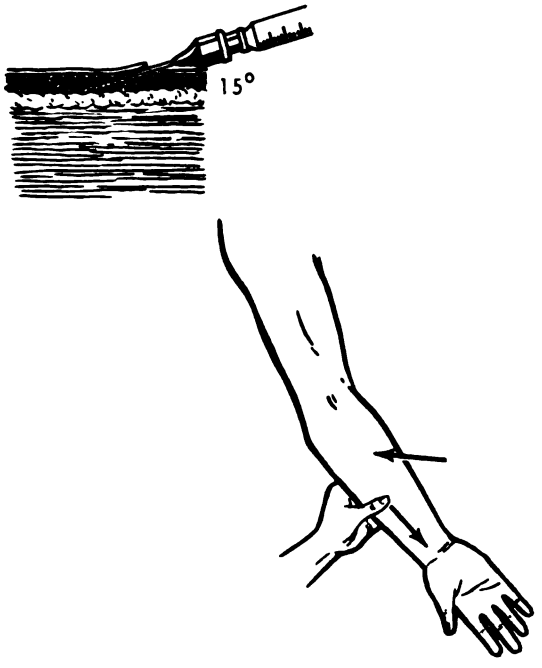


Figure 4–10. Intradermal injection.

3. Focus light (bed lamp or portable lamp) on injection site. Visualization of area during injection is an essential part of procedure. Place light in your line of vision to avoid shadow.
4. Prepare skin at site of injection by applying a colorless, nonalcoholic germicide in a spiral motion. Allow area to air dry completely.
5. Pick up syringe and hold upright for a final check of exact dose. Compare dose with medicine card. Expel any air or excess solution.
6. Hold skin at selected site taut by placing the thumb of the left hand below the cleansed area and drawing the skin down toward the wrist.
7. Holding the syringe with needle bevel up, insert the needle point at about a 15-degree angle, advancing the needle only enough to cover the bevel. Allow skin and needle to ride back in place together, then use supporting hand to push the plunger. Press the plunger slightly. The solution will form a small bleb (elevation such as a blister) in the skin. If the bleb appears, inject the required amount of solution.

CAUTION

Take care to hold the needle steady and not to run the tip out of the skin or the other side of the bleb.

8. Gently withdraw needle. Gently blot the injection site with a dry, sterile sponge. Do not massage.
9. Caution patient not to rub or scratch the intradermal injection site, even though it may itch. Irritation will give a false reading at a later time.
10. Cover needle with plastic sheath and place on tray. Take equipment to workroom. Break needle, using sheath to protect fingers. Discard disposable syringe. Rinse reusable syringe in cold water, separate barrel and plunger, fasten with elastic band, and place at CMS collection point.
11. Record injection in Nursing Notes.

4–30. Intravenous (IV) Injection Procedure

Intravenous injection of any material is not a routine nursing procedure. The medical officer will usually prepare the drug for injection and nursing personnel assist as required with assembling the equipment and assisting with the venipunc-

ture. In an emergency, the medical officer will often remain with the patient and give a verbal order for preparation of an IV medication. In this situation, follow the procedure in paragraph 4–26. Then take the drug and solution vial used for withdrawal of the medication with the prepared syringe and needle and show the drug label to the medical officer for his verification.

4–31. Administration of Eye Drops and Eye Ointments

a. Containers. Drug preparations for the eye are dispensed from the pharmacy in individual dropper bottles, dispensing squeeze vials, or ointment tubes. These containers are labeled "ophthalmic" and usually identified with an individual patient's name. When the drug is administered, take the prepared medicine card identifying the eye to be treated, the properly identified drug container, and a container of tissue wipes to the patient's bedside.

b. Physical Considerations—the Conjunctiva. In treating the eye, remember a few basic facts concerning its structure. The conjunctiva (the mucous membrane which covers the front portion of the eyeball and lines the eyelid) absorbs medication placed in the eye. If the medication is applied to the inner surface of the lower lid, the natural blinking reflex of the eye distributes the ointment.

c. Precautions in Instilling Medication.

(1) Wash hands immediately before treating the eyes. Have fingernails short and clean.

(2) After removing cap from ointment tube, squeeze a small amount on sterile gauze to remove any crust that might have formed; discard this.

(3) Do not invert dropper after withdrawing solution as there is danger that small particles of rubber might become mixed with the medication.

(4) Do not touch tip of dropper or tip of squeeze vial or ointment tube to the skin of the face or lids. This will contaminate the sterile medication.

d. Instillation of Eye Drops or Eye Ointment.

(1) Instruct patient to tilt head backward and look upward with eyelids open.

(2) Place forefinger on skin below lower eyelid and pull down gently. This creates a small conjunctival pocket in the lower lid in which to instill the medication.

(3) With the tip of the dropper close to but not touching the pocket, instill required number of drops of medication. If ointment is used, run a thin ribbon of ointment just above surface of the pocket.

(4) Release the skin held by the fingertip. The normal eye blink reflex will distribute the medication evenly. No rubbing or pressure on the upper lid is necessary or desirable.

(5) Blot closed margin of eyelid gently with a clean tissue wipe to remove excess medication. Blot from inner canthus outward.

4–32. Administration of Nose Drops

Vasoconstrictor drugs are dispensed in solution, in dropper bottles, or in jellies in nasal-tipped applicator tubes. Instill these drugs into the nostrils to shrink the nasal mucosa. This will open the respiratory passages and allow better drainage of the paranasal sinuses. Position the patient properly, or the instilled medication will run into the nasopharynx and be expectorated by the patient. Then the medication will not have its intended effect. After washing hands, follow these steps:

a. Position the patient flat in bed, with his head extended over the edge of the bed.

b. Place three or four drops of the solution in each nostril. Instruct the patient to remain in position for 3 minutes.

c. Do not return a dropper which has touched the nostril to the bottle of solution, as the entire bottle will be contaminated. Use individual clean droppers for each instillation. Discard any solution remaining in the dropper.

4–33. Administration of Ear Drops

Ear drops may be ordered for treatment of infections of the external ear or for skin disorders that are noninfectious. Since otitis (external ear disorders) can be extremely painful, handle the auricle and tragus gently. Ear drops such as Burow's solution may be ordered to soothe and cleanse the inflamed membranes of the ear canal. Other prescribed drops may be solutions of antibiotics. To instill ear drops, obtain the medicine card, the prescribed drops, and some cotton pledgets. Follow this procedure after washing hands:

a. Check the medication for accuracy and have the prescribed number of drops in the dropper.

b. Tilt the patient's head so that the affected ear is uppermost. Gently pull the auricle of the ear up and back (for children, see para 10–34*b*). Direct the tip of the dropper toward the vestibule of the ear. Instill the required number of drops.

c. Place a pledget of cotton in the vestibule but do not push into the ear canal. The pledget will serve as a wick.

4–34. Administration of Drugs by Aerosol Inhalation

(fig. 4–11)

Drugs in a distilled water solution are administered by aerosol inhalation. A nebulizer (fig. 4–11) attached to a compressed air (or oxygen) supply converts the solution into a fine mist which is inhaled deeply into the trachea and bronchi. (An ordinary spray atomizer cannot be used for aerosol inhalation because the droplets are too large and disperse in the throat, rather than deep in the respiratory tract.) When continuous aerosol therapy is necessary, a specially designed jet humidifier is used in combination with an oxygen hood or croupette. The drugs used in aerosol therapy may be a mucolytic detergent agent to liquefy bronchial secretions; an antibiotic drug in solution; a broncho-dilator drug; or a combination of all three types of medication. When aerosol therapy is ordered, the patient needs special instruction for effective administration of the medication. When oxygen is used, all safety precautions for the use of oxygen must be observed (ch. 5).

a. Equipment. Two lengths of rubber tubing, connected by a Y-tube, are attached to the nebulizer. The free end of the tubing is attached to the air supply or oxygen cylinder regulator. The measured amount of prescribed solution is placed in the nebulizer (1 ml. of solution will be nebulized in approximately 10 minutes when oxygen is regulated to 4 liters per minute).

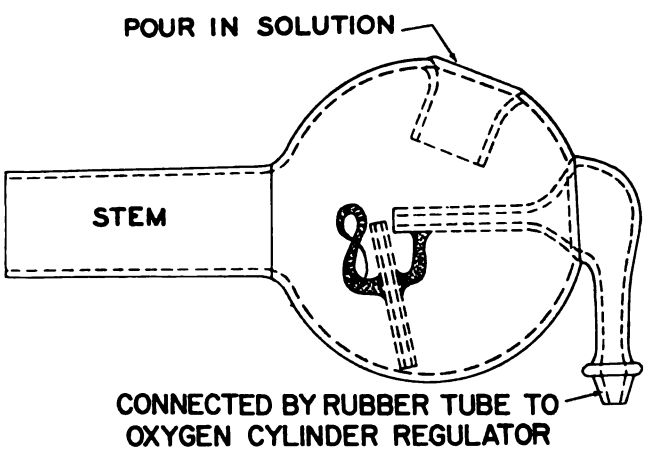


Figure 4–11. Diagram of a nebulizer.

b. Administration.

(1) Have the patient sit upright, supported in a chair or by the elevated bed gatch.

(2) Instruct the patient to place the open stem end of the nebulizer in his mouth and to close his lips loosely about the stem. (He must not suck on the stem end.)

(3) Close the Y-tube opening with the thumb while patient inhales through the mouth. Open the Y-tube during exhalation. With this Y-tube technique, the solution is nebulized only during inhalation, and the prescribed amount of drug is not wasted.

(4) Following each treatment, rinse the nebulizer thoroughly with cold water to remove any residual medication and to prevent clogging. Use an individual nebulizer for each patient. When this is not possible, disinfect the nebulizer by proper use of the prescribed chemical germicide.

4–35. Administration of Rectal Suppository

Drugs contained in a rectal suppository may be intended for a local effect on the mucous membrane of the rectum or for general systemic effect following absorption. Thus if the suppository is expelled before it has melted, little or no therapeutic effect can be anticipated. The specialist must always know why the suppository is being administered; *for example,* is it a local analgesic, an evacuant to induce a bowel movement, or an antispasmodic for relief of asthma?

a. Equipment: Prescribed suppository (often stored in the refrigerator), rectal glove, surgical lubricant, tissue, and emesis basin.

b. Procedure: screen patient; turn patient on side to expose anal sphincter; lubricate suppository and gloved index finger. Instruct patient to breathe through the mouth to relax the anal sphincter, and insert suppository. With gloved finger, advance suppository into the rectum. Apply pressure over anal sphincter until the patient's impulse to expel the suppository has subsided.

Section V. DOSES AND USES OF DRUGS IN FIELD MEDICAL SETS

4-36. General

a. Drugs discussed in this section are those provided in field medical sets authorized for medical companies, medical elements of nonmedical units (when medical officer is authorized), and medical treatment detachments.

b. Drugs are presented under generic or nonproprietary names and are listed under a therapeutic usage classification.

4-37. Analgesics

a. Nonnarcotic. Aspirin acts as an analgesic and an antipyretic. As an analgesic, it relieves headaches and muscular pain. As an antipyretic, it reduces the temperature in fever but does not affect normal body temperature. Aspirin normally is issued as 0.324-Gm. tablets in bottles. Often it is combined with other analgesics such as phenacetin and caffeine (APC). In large and continued doses, aspirin produces gastric irritation.

b. Narcotic. Both narcotics discussed here, morphine and codeine sulfate, are derivatives of opium. Both depress the central nervous system. Both are constipating. Either may cause addiction. Both must be accounted for in the narcotic register.

(1) *Codeine sulfate.* This drug normally is supplied as 32-mg. tablets. Codeine sulfate acts like morphine although it is much weaker. It is used to relieve moderate pain and to stop nonproductive cough (cough without sputum). Codeine sulfate should not be used when there is any sputum to be coughed up; stopping such a cough is not good for the patient.

(2) *Morphine.* Morphine syrettes will be found in the individual surgical instrument and supply set and in medical aid station equipment. They are prepared for immediate injection in collapsible tubes with sterile needles. Each syrette contains 16 mg. of morphine.

4-38. Anesthetics

a. General Anesthetics. General anesthetics are central nervous system depressants which produce deep unconsciousness, thus causing loss of pain sensation throughout the body. The degree of pain loss depends upon the depth of unconsciousness.

(1) *Ether.* Ether is used to produce surgical anesthesia by inhalation. In addition, it is sometimes used to clean the skin for smallpox vaccination or similar injection. Ether is issued in small cans. It is highly flammable and should be stored in tight, light-resistant containers distant from fire.

(2) *Thiopental sodium.* Thiopental sodium is a barbiturate. It is injected intravenously when a fast-acting general anesthetic is desired. Dosage of the drug should be determined by a medical officer. Thiopental sodium normally is issued in 0.5-Gm. ampules packaged in boxes. Sterile water is provided to put the drug into solution for injection.

b. Local Anesthetics. These drugs produce anesthesia in a limited area around the site of their injection or application by preventing transmission of pain impulses along the sensory nerves.

(1) *Procaine hydrochloride.* This drug normally is supplied in an ampule as a 1-percent solution for injection. It is one of the least toxic injectable local anesthetics. Often it is combined with epinephrine to prolong its effect. As with all local anesthetics, procaine hydrochloride must not be injected into a vein. The amount and strength of the drug to be used will vary with the method of inducing local anesthesia. However, the 1-percent solution is one of the common strengths used.

(2) *Lidocaine hydrochloride.* This drug normally is supplied as a 2-percent solution for injection. It is about twice as potent as procaine hydrochloride. It is used for local anesthesia in dental and general surgical procedures. The dose of lidocaine hydrochloride is determined by a medical officer. Often it is combined with epinephrine to prolong the anesthetic action. When supplied as a jelly, it can be applied topically to produce local anesthesia.

(3) *Dichlorotetrafluorethane.* This drug is supplied in an 8-ounce aerosol can. It is sprayed on the skin as a refrigerant for minor operative procedures, such as incision and drainage.

(4) *Tetracaine hydrochloride.* This drug normally is supplied as ophthalmic ointment, 0.5 percent, in a tube. It is used in the eye to relieve local pain due to infection or injury. It does not dilate the pupil of the eye or cause other noticeable side effects. To apply the ointment, squeeze a small amount from the tube onto the lining of the lower eyelid.

(5) *Eugenol (oil of cloves).* Eugenol is a surface anesthetic. It is used in dentistry to give

temporary relief from toothache. Eugenol is supplied in a bottle for topical application by means of a cotton pledget.

4—39. Antacids

Aluminum hydroxide-magnesium trisilicate tablets, through local action in the gastrointestinal system, are used to relieve excess acidity in the stomach and the consequent pain in gastritis and peptic ulcer. The combination of the two drugs provides relief without causing constipation. The tablets should be chewed slowly and swallowed with a small amount of water; unless some fluid is taken, the drug preparation may only coat the esophagus and not reach the stomach.

4—40. Antibiotics

The time intervals for administering these drugs and the total dosage received are particularly important. Sensitivity reactions must be anticipated.

a. Tetracycline Hydrochloride. This is a broad spectrum antibiotic (effective against a relatively wide range of organisms). It is supplied in 250-mg. tablets for oral use. Dosage is determined by the medical officer. A possible side effect of nausea is reduced if the drug is taken with milk, rather than with water.

b. Penicillin. This drug is prescribed for infectious conditions in which the organism is sensitive to penicillin. It is supplied as an oral tablet and as a parenteral preparation, usually in a cartridge-syringe unit. The possibility of hypersensitivity to penicillin must always be emphasized. Ask the patient if he has had previous signs and symptoms (rash, hives, itching, wheezing respirations) of reactions to penicillin before administering the drug; any doubtful sign of hypersensitivity should be reported to the medical officer, who will make the decision as to administering the drug prescribed.

(1) *Potassium penicillin G tablets, 250,000 units.* This is used as oral medication and is often prescribed for prophylaxis against streptococcal infection for individuals who have had rheumatic fever; in these cases, treatment may be indicated for several years.

(2) *Procaine penicillin G in oil, 400,000 units.* This is a preparation of penicillin in a sterile oil base for intramuscular injection. It is supplied in a cartridge-syringe unit. The oil base provides for slow absorption and sustained anti-infective action. It must be injected deeply and slowly into gluteal muscle, using strict aseptic technique to avoid the possibility of abscess formation. Each dose in units and the frequency of administration must be indicated for the total dosage required. The schedule for administering this preparation should specify the exact date on which the injection is to be given, to prevent the possibility of underdosage or overdosage.

c. Antibiotic Ophthalmic (Eye) Ointments. These are sterile ointment preparations (such as chlortetracycline hydrochloride 1-percent ophthalmic ointment and polymyxin B, bacitracin, neomycin ophthalmic ointment) used to treat bacterial infections of the eyelids and surface of the eye. They are supplied in small, applicator-tipped tubes for use on an individual patient. Before each application, it is desirable to clean away the crusts that accumulate along the infected lid margins. Hot moist compresses to the eye are recommended cleansing agents. A thin ribbon of ointment is applied to the inner lining of the lower lid, and the natural blinking of the eye distributes the ointment. Antibiotic ointments may also be ordered as prophylactic treatment when the cornea has been injured. Antibiotic eye ointments are used only when prescribed by a medical officer.

d. Bacitracin-Neomycin Ointment. This combined antibiotic preparation is supplied in ½-ounce tubes for local application to superficial skin infections, such as a secondary infected insect bite. The skin area should be cleansed of any crusts or purulent secretions by thorough washing with a surgical soap or detergent-antiseptic solution before the ointment is applied. A dressing is omitted unless the area must be protected from contact with clothing.

4—41. Sulfonamides

Sulfisoxazole, a sulfonamide, is characterized by a relatively high solubility in body fluids. For this reason, sulfa crystals in the urine are less apt to form. Sulfisoxazole is used particularly for infections of the urinary tract. Fluids need not be forced, but the patient should be told to drink at least 3000 ml. of water daily to help dilute the urine and flush out the urinary tract. The drug is supplied in 0.5-Gm. tablets. Sensitivity reactions to sulfa drugs include a rash, hives, nausea, and a fever that seems to have no connection with the progress of the disease. For this reason, a rise in temperature after drug treatment has started is significant and should be reported.

4-42. Antimalarials (Plasmodicides)

Antimalarial drugs are used both for therapeutic treatment of an acute attack of malaria and for prophylactic-suppressive treatment for all personnel in an endemic malaria area. Different drug preparations and different dosages are used in each instance.

a. Chloroquine Phosphate. This drug is supplied in 0.5-Gm. tablets for oral administration. It is used in the therapeutic treatment of acute malaria. Following completion of the prescribed therapeutic dosage schedule, the individual patient resumes the prophylactic regimen prescribed for personnel in the assigned area.

b. Chloroquine-Primaquine Combined Tablet. This chemoprophylactic drug is adminis ered to all personnel assigned in an endemic malaria area. The purpose is to prevent an acute attack and is one part of an intensive preventive medicine program. One tablet is taken orally after a meal on the same day of each week that the individual remains in the area. This regimen is continued after leaving the area for a minimum of 6 weeks and preferably for 8 weeks.

4-43. Antifungal Agents

a. Undecylenic Acid Ointment. This ointment is packaged in 1-ounce tubes. It is used to treat fungus infections of the feet (athlete's foot), ringworm, and fungus infection of the crotch. The best time to apply this fungicidal ointment is at night.

b. Fungicidal Foot Powder. This powder normally is supplied in 1-ounce cans. It is dusted onto the skin in treatment of fungus infections of the skin, especially athlete's foot. It should be applied during daytime, preferably at the beginning of the day.

4-44. Antihistamines

The drugs discussed below have as a side effect drowsiness or dizziness. Individuals receiving these drugs should be cautioned against driving an automobile or engaging in other activities requiring alertness.

a. Diphenhydramine Hydrochloride. This drug normally is supplied as 50-mg. (¾ gr.) capsules. It is used to treat such allergic conditions as asthma, hay fever, hives (urticaria), contact dermatitis, and skin rashes due to penicillin or other drugs. The usual dose is 50 mg. given 3 or 4 times a day. The main side effect of this drug is drowsiness. A form for subcutaneous injection is provided in a sterile solution containing 10 mg. per ml. This is used only in severe allergic reactions.

b. Chlorphenaramine. This drug is an ingredient in a combined drug "cold tablet," used to relieve symptoms of hay fever and the common cold. The usual dose is 1 tablet 3 times a day and 1 tablet at bedtime. Side effects occur with less frequency than with diphenhydramine, but the individual must be cautioned that he might become drowsy or dizzy.

4-45. Antiparasitic Agents

a. Gamma Benzene Hydrochloride Ointment (Gexane). This ointment normally is supplied in 2-ounce tubes. It is for topical use against lice and the mites which cause scabies (itch). Usually one application of the ointment is enough. It is irritating to mucous membranes and should not be allowed to touch the eyes. The individual should not bathe or wash the hair for 24 hours following application of the drug. After a cleansing bath and shampoo, clean clothing and bed linen should be used. The infested clothing and bed linen must be laundered. The preparation may not destroy the nits (eggs) of body lice, so a second application may be necessary 1 week later. The hairy parts of the body should be closely examined for nits, as they cling to hair shafts.

b. Lindane, 1-Percent. This powder is used to treat pediculosis (infestation by lice). It should be dusted on the hairy portions of the body and left there at least 24 hours. The treatment should be repeated after one week. The powder should also be dusted onto the seams of the patient's clothing and bed clothing. After the delousing treatment, the clothing should be changed and the infested clothing laundered. The patient should be dusted again if he bathes between the two dustings.

4-46. Antiseptics and Germicides

a. Antiseptics.

(1) *Benzethonium chloride.* This drug normally is issued as 250-mg. tablets. In a 1:1,000 aqueous solution, it is used externally as a general-purpose antiseptic. This solution is made by dissolving four tablets of benzethonium chloride in 1 quart of water. The presence of soap on surfaces on which benzethonium chloride is to be used will reduce the antiseptic action of the drug. All washed surfaces must be thoroughly rinsed

with this antiseptic. In the nose and eye, the 1:1,000 solution is diluted with four parts of water to make a 1:5,000 solution.

(2) *Benzalkonium chloride tincture.* This drug is supplied in a 1:1,000 solution, tinted red, in applicator-tipped vials. It is used as a skin antiseptic. Since it contains alchol, it will cause a stinging sensation when applied to abraded areas.

(3) *Thimerosal tincture.* This is a tinted solution, for use on superficial breaks in the skin or for minor abrasions. Warn the patient that it will sting momentarily when applied.

(4) *Alcohol, USP (ethanol, ethyl alcohol).* Alcohol normally is supplied in a 1-pint can. Its original strength (92.3 percent by weight) must be diluted pharmaceutically according to its required use. As a cooling skin rub, it is used in concentrations of 25 to 35 percent; as a skin antiseptic and as a germicide, a concentration of 70 percent is recommended. When alcohol is prescribed for internal use, only alcohol, USP, is to be given. Receipts and expenditures of alcohol must be accounted for in the narcotic and controlled drug register.

b. Germicides. Disinfectant, Germicidal and Fungicidal Concentrate (Wescodyne) is a general-purpose germicide, suitable for hand cleansing as well as for disinfecting thermometers and instruments, washing furniture, floors, and equipment. The concentrate must be diluted to make a 75-parts-per-million (ppm.) solution. This 75 ppm. solution is made by adding 18 ml. of concentrate to 4000 ml. (1 gallon) of water. The clear, dark amber color of this solution is an indication of its germicidal effectiveness; when the color fades, a fresh solution must be prepared.

4-47. Cathartics

a. General. Cathartics should never be given to an individual who has undiagnosed abdominal pain. In addition, cathartics are prescribed with great caution when there is any inflammatory condition of the intestines. These drugs are used primarily to empty the colon in the treatment of simple constipation. In giving a cathartic, consider the length of time the drug takes to act, so that the individual's work or sleep is not needlessly interrupted by bowel movement.

b. Senna Pod Extract Tablet. This drug works by a slow liberation of irritant derivatives in the intestines. Its action is mild and not accompanied by griping or discomfort. The usual dose is 2 tablets, followed by a generous amount of water (2 glasses). Bowel evacuation can be expected in about 8–12 hours.

c. Liquid Petrolatum (Mineral Oil). Liquid petrolatum is a mild laxative. It softens and lubricates the intestinal contents. By preventing absorption of water from the intestines, the oil increases the bulk of the contents. This enlarges the intestines, and bowel movements result. The usual adult dose of liquid petrolatum is 15 ml. (½ ounce) once or twice a day. Continuous use of large amounts of liquid petrolatum should be avoided because some vitamins are soluble in oil. They are absorbed and excreted from the body with the oil. A disadvantage of mineral oil is that it is apt to leak from the rectum and soil the clothing.

d. Magnesium Sulfate (Epsom Salt). Magnesium sulfate normally is supplied as dry crystals in a 2½-pound can. It is an active cathartic when given orally. It is also a mineral salt which draws water out of the tissues into the intestines. The water increases the bulk of the intestinal contents and the salt irritates the mucous membrane lining of the intestine, both effects causing increased bowel movement. This cathartic is best given in the morning when the stomach is empty. It usually acts in 1 to 2 hours, resulting in a watery bowel movement. The usual dose of magnesium sulfate is 15 Gm. (½ ounce) in ½ glass of water. Saline cathartics, such as magnesium sulfate, are used in some cases of food or drug poisoning; for relief of edema; and in conjunction with specific drugs for treating worms.

4-48. Counterirritants

Methyl salicylate (oil of wintergreen) is a counterirritant used as a liniment to treat painful muscles and joints. For topical application, methyl salicylate is used in concentrations of about 10 percent. The drug is poisonous. It should be labeled "For External Use Only" and kept out of reach of children since as little as 4 ml. of methyl salicylate taken internally can be fatal. The oily nature of this preparation and its penetrating odor create problems in packing and storing the container unless the cap is leakproof.

4-49. Emollients and Protectives

a. Emollients.

(1) Petrolatum gauze is used to protect the skin area surrounding a draining wound. Nor-

mally it is supplied in sterile foil-sealed packets. The required length of gauze is removed, using aseptic technique. Once the packet has been opened, the sterility of the remaining contents is lost.

(2) Surgical lubricant is a sterile jelly supplied in tubes. It is a water-soluble preparation used on the skin and for lubrication of catheters, rectal thermometers, and rectal gloves. It contains a preservative to maintain its sterility after the seal is broken, providing that aseptic technique is used in squeezing the required amount from the tube and in replacing the cap.

b. Protectives. Benzoin tincture, compound, normally is issued in a 1-pint can. When it is used to protect the skin under adhesive strapping, it is painted on the required area with an applicator swab. It must then dry on the skin before the adhesive is applied. Because of its aromatic nature, benzoin compound is also added to the water used for steam inhalations to relieve bronchial congestion and irritation.

4-50. Sedatives, Hypnotics, and Tranquilizers

a. Barbiturates. These drugs are derivatives of barbituric acid. They are powerful depressors of the higher levels of the central nervous system. Their effects range from mild sedation to deep coma (the barbiturate, thiopental sodium, is a general anesthesia agent). They all produce a side effect of respiratory depression, which is the main cause of death in overdoses. Barbiturates are administered orally, rectally, subcutaneously, or intravenously. They are drugs which are known to produce habituation.

(1) *Secobarbital sodium.* Normally this drug is supplied as 0.1-Gm. oral capsules. It acts as a sedative and a hypnotic. It is used as a preanesthetic medication, to induce sleep or to reduce nervousness. The usual hypnotic dose of secobarbital sodium for adults is 0.1 to 0.2 Gm., and the usual sedative dose is 50 mg. As a preanesthetic agent, 0.2 to 0.3 Gm. of secobarbital sodium is given ½ to 1 hour before the patient is sent to the operating room. This is a large hypnotic dose, and the patient must be in bed until he is transferred to the operating room litter.

(2) *Phenobarbital.* This drug normally is supplied as 32-mg. oral tablets. It is classified as a long-acting barbiturate. It is used as a sedative, hypnotic, and anticonvulsant. As an anticonvulsant, phenobarbital is used particularly to prevent or control convulsive seizures associated with epilepsy. The usual sedative dose of phenobarbital is 32 mg., given up to 4 times a day. Phenobarbital is excreted mainly by the kidneys. Therefore, it should be used cautiously in patients whose kidneys are not working properly.

b. Chlorpromazine Hydrochloride. This drug is a phenothiozine derivative. It has a tranquilizing effect, helping to relieve anxiety and neuromuscular tension. It is also used as an antiemetic. The drug is supplied in ampules, containing 25 mg. of drug per ml. of solution. It is irritating when given subcutaneously, and an intramuscular injection must be given deeply and slowly. The usual dose is 25 mg. IM. A side effect is a sudden drop in blood pressure. Since an ambulatory patient may faint if this occurs, he should be told to remain in the treatment area, so that he can lie down and be observed for an hour or more. If the vital signs are stable, the patient should be accompanied to quarters after the observation period. He can expect to feel drowsy.

4-51. Vasoconstrictors

a. Epinephrine (Adrenalin). Epinephrine is extracted from the adrenal glands of domesticated animals and is made synthetically. It is normally supplied in a clear, sterile solution of 1:1,000 for subcutaneous or intramuscular injection, the amount being determined by a medical officer. It is inactive when given orally. For topical application to check hemorrhage, as in nosebleed, concentrations of 1:1,000 to 1:10,000 are used. A 1-percent solution is used for inhalation. Epinephrine must be used cautiously in patients with cardiovascular disease or high blood pressure as it acts as a vasoconstrictor and a heart stimulant. Its effect on blood vessels is marked. A wide white area develops at the site of injection of epinephrine.

b. Metaraminol Bitartrate (Aramine). This drug is a powerful vasoconstrictor used in some acute shock conditions to help restore and maintain the blood pressure. It is supplied in 10-ml. ampules, containing 10 mg. of drug per ml. The drug is added to 500 ml. of sterile IV saline solution by the medical officer who must control the amount of drug and rate of flow of the IV to maintain the blood pressure at a predetermined level. The patient's blood pressure is taken every 2 minutes from the time the drug is started until the desired level of blood pressure is obtained, and every 2 to 5 minutes thereafter. Constant observa-

tion of the patient and the IV apparatus is mandatory.

c. Phenylephrine Hydrochloride (Neo-Synephrine). Phenylephrine hydrochloride is generally used in 0.25-percent or 1-percent solutions or in the form of a 0.5-percent jelly for application to nasal membranes. Used in this manner the drug causes vasoconstriction and acts as a nasal decongestant. Phenylephrine hydrochloride should be used cautiously in patients with heart disease or high blood pressure.

CHAPTER 5

BASIC NURSING PROCEDURES

Section I. INTRODUCTION TO NURSING CARE

5–1. Meaning of Nursing Care

Nursing care is doing needful and helpful things for and with a sick or injured person to restore him to the best possible state of physical and mental health. These needful and helpful things include environmental, hygienic, therapeutic, and supportive measures to protect the patient against contracting any additional pathological condition, physical or emotional. Body, mind, and spirit must all receive attention.

5–2. Nursing Care Team

Several different members of a nursing team assist a patient, each of whom contributes something toward the patient's welfare. Each member must understand and appreciate the other's role. Each must know where he fits in, what he is to do, to whom he is responsible, and how he is to do his part. Otherwise, team function is impossible, and the patient is in danger of being a forgotten person instead of the focus of all effort. In an Army Medical Department nursing situation, there is an established relationship between the medical officer, the nurse officer, and the enlisted specialist.

a. The Medical Officer. A doctor is the traditional head of the overall patient care team. He makes decisions and gives orders for the care and treatment of patients. He is responsible to the chief of his service for the patients and for the efficient operation of the ward. The doctor delegates appropriate patient care responsibility to nursing team members and requests services from other departments such as laboratory, radiology, and food service.

b. The Nurse Officer. The nurse officer is the professional nurse member of the team. She determines how the doctor's orders are to be carried out. She is responsible to the doctor and to the Chief, Nursing Service, for the nursing care and instruction of patients, the management of the ward or clinic unit, and the supervision and instruction of enlisted team members.

c. Enlisted Specialist. The enlisted specialist functions in three recognized skill, training, and experience capacities.

(1) The medical corpsman, 91A is the apprentice, the beginner. By carrying out routine, simple nursing procedures under supervision, he gains needed skill and experience in working with patients. While assisting in specified ways in more complex situations, he gains insight into the multiple details that make up individualized patient care.

(2) The medical specialist, 91B, at an intermediate technical skill level, is learning to apply his experience in increasingly complex nursing situations requiring both skill and judgment.

(3) The clinical specialist, 91C, is at an advanced technical skill level, applying his background training and experience in nursing situations requiring both skill and judgment.

5–3. Desirable Attributes of the Medical Specialist

The enlisted specialist may perform any of a number of duties common to the provision of nursing care for sick and wounded individuals. To function effectively in this role, he must possess certain personal attributes or qualities. Many of these attributes are inherent (belonging by nature to the individual), others must be cultivated and improved upon, and all are interdependent. Basic attributes of a good medical specialist include—

a. Aptitude. This is potential capacity for learning and performing a duty. The ability to anticipate needs of patients, to make appropriate decisions, and to adapt to various working conditions; intelligence; and a fairly high degree of manual dexterity indicate an aptitude for nursing care duties.

b. Interest. Interest in a duty assignment is a reflection of morale and leadership. It is a strong motivating force to perform satisfactorily. Interest leads one to improve upon abilities and to improve job knowledge. Senior medical specialists who function in supervisory positions should strive to stimulate and encourage less-experienced individuals.

c. Attitude. Attitude is a manner of acting, feeling, or thinking that shows the individual's disposition or opinion. It is the action that speaks louder than words. A desirable attitude is one which leads to—

(1) Cooperation and understanding among people working together.

(2) Concern and consideration for the welfare of patients.

(3) A sense of satisfaction in knowing one's job, with a resulting series of positive accomplishments. The gratitude of patients who have been assisted to recovery is an extra dividend.

d. Personal Hygiene. Personal hygiene is usually considered personal cleanliness. It is that, but it is also anything that promotes positive or total health, which includes mental hygiene.

(1) *Cleanliness.* Scrupulous body cleanliness and clean, well-fitting uniforms, shoes, and underclothing are essential. Body odors are very offensive, yet the offender may be unaware of his offense. Daily bathing, use of body deodorants, and good oral hygiene are insurance against such odors. It is also a good practice to wear a clean, freshly laundered uniform daily, especially in patient care areas. When this is not possible, the uniform should be removed after duty hours and hung up so as to air it between wearings. Sweaters and other infrequently laundered outer garments should not be worn when assisting with direct patient care.

(2) *Mental hygiene.* Mental hygiene is the practice of good habits of the mind. Good mental habits can be cultivated. These habits are as necessary to health as safe food and water to body systems. A mentally healthy adult enjoys life, works well with others, and can take disappointments as a part of living. Tolerance of others and respecting the rights of others are part of mental hygiene.

(*a*) A good mental habit to cultivate is enjoyment of the companionship of members of the group to which assigned. Also, an emotional bond must be developed with individuals who are undergoing similar experiences. It is normal to become deeply concerned and to need to discuss experiences in patient care situtions, but these discussions must be held in appropriate locations and under appropriate circumstances; *for example,* in ward conferences. Experiences shared on the ward must not be discussed in public areas such as elevators and mess halls.

(*b*) Personal anxieties and frustrations can be combated if they can be expressed in words and shared with associates. If personal problems need expert guidance for solving, the experts available in the Army organization—company commander, chaplain, legal advisory officer, or medical officer—should be consulted. The specialist never discusses personal problems with patients nor does he ever become personally involved with a patient's problems.

5–4. Classification of Nursing Procedures

a. Routine Procedures. Procedures performed on a repetitive basis, requiring little or no modification to meet individual needs of a patient.

b. Basic Procedures. Procedures developed to meet daily hygienic, comfort, and therapeutic needs of patients. Some of these procedures involve direct patient care, such as bathing; feeding; positioning; and taking the temperature, pulse, and respiration. Some of them involve indirect patient care, such as maintaining ward cleanliness, preparing supplies and equipment, and maintaining clinical records and reports.

c. Simple and Complex Nursing Procedures. The term "simple" must be considered in relation to the total nursing situation. Four factors determine simplicity or complexity. It is a simple nursing procedure if (a) abilities required to perform the procedure are based on a comparatively limited background knowledge of scientific facts, (b) it can be performed by following a defined procedure step by step, (c) it is performed for a patient whose clinical state is relatively stable, and (d) the instructional needs of the patient are minimal. A variation in any of these four factors contributes to the complexity of a procedure. *For example,* giving a bed bath and making an occupied bed can be a routine, basic, simple nursing procedure, or it can be an exceedingly complex procedure, depending upon the condition of the patient. In a simple nursing situation, the medical corpsman would be assigned to carry out the pro-

cedure with minimal assistance and supervision; in a complex nursing situation, the clinical specialist would be assigned to assist the nurse or medical officer with some phases of care and would carry out other phases with supervision and direction.

Section II. CARING FOR THE PATIENT'S ENVIRONMENT

5–5. General Measures for Preventing Spread of Infection

a. General. All personnel and all patients, regardless of position or diagnosis, should be recognized as potential carriers of pathogenic organisms. It is therefore essential to consider practices that prevent the transfer of these organisms from one person to another. These practices are all essential elements of individualized patient care and of medical asepsis.

b. Individualized Equipment. This is equipment that remains within the patient unit and must not be transferred or borrowed for use by other patients. It includes pillows, blankets, and personal toilet articles. Utensils in common use such as bedpans, urinals, or basins are thoroughly washed and sanitized in boiling water after each use since all body discharges must be handled as contaminants.

c. Treatment Equipment. Trays containing equipment used for venipuncture, thermometer trays, blood pressure equipment, etc., are used for more than one patient. They should be transported on a wheeled table that will serve as a clean work area within the patient unit. It is an unsafe practice to place such trays in common use on a bed or bedside stand.

d. Linen. Used linen is placed directly into laundry bags, never on the floor. No counting or sorting of soiled linen should be done on hospital wards. Linen that has been placed in a patient unit must not be returned to the linen room even though unused.

e. Waste Receptacles. Wastebaskets and other receptacles should be lined, preferably with plastic liners, to facilitate the sanitary collection of waste. Paper bags should be provided at every bedside for disposal of tissues and other personal debris. Soiled dressings must be placed in bags or other wrappings, removed from the patient area immediately, and discarded in a lined, covered receptacle such as a step-on sanette can.

5–6. Handwashing Procedures

Washing the hands before and after caring for a patient is the most important single factor in preventing the spread of disease. The entire procedure can be done effectively in 1 minute.

WITH RUNNING WATER

Preferred methods of controlling water supply and cleaning agent are levers operated by the foot, knee, or elbow. (The insides of sinks and hoppers are considered contaminated; that is why stoppers and plugs are not used in sinks in ward areas.) When sinks with faucets and cake soap are used, turn the faucet on with bare hand. Rinse lather from soap before placing on a pronged soap rest to dry. (Soap is contaminated when left in a puddle of soiled lather drippings.) Always turn faucet off with a clean paper towel to protect clean hands.

Procedure

1. Adjust water flow to warm.
2. Wet hands.
3. Apply cleansing agent.
4. Work up a lather, using friction. Pay attention to web spaces between fingers by combining interlocked finger movements with palm and dorsal friction. Wash with lather for 20 seconds.
5. Rinse thoroughly, holding hands down to allow water to drain off fingertips (fig. 5–1).
6. Dry hands thoroughly with clean paper towel.
7. Apply hand lotion p.r.n. to keep skin in good condition.

WITH BASIN

A basin is used only as an expedient when running water is not located convenient to a patient care unit. The basin provided for handwashing must be emptied and refilled frequently, and at least every 8 hours with a fresh germicide-detergent solution. The solution used must be prepared in the recommended concentration to provide cleansing action that will not be injurious to the hands. (Paragraph 4–46*b* gives instruction for preparation and use of Wescodyne handwash solution).

One-Basin Procedure

1. Immerse hands and wrists in the prescribed solution.

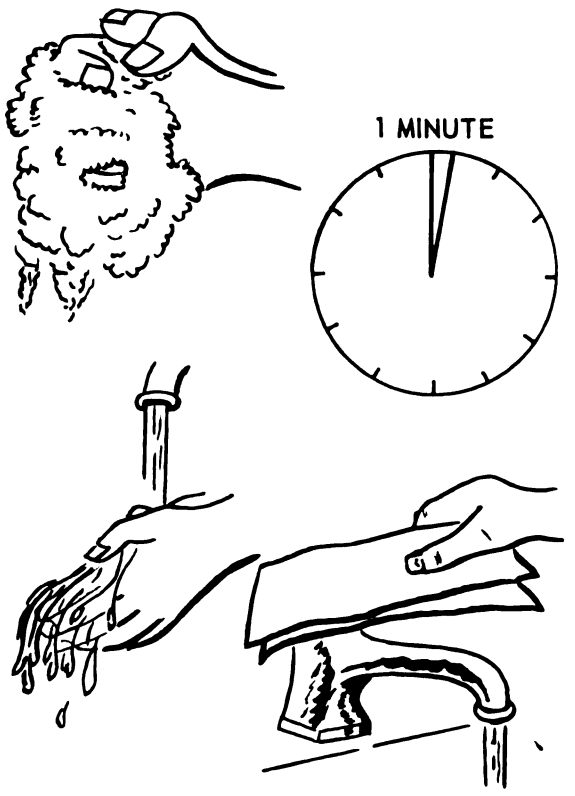


Figure 5-1. Handwashing technique.

2. While hands are immersed, rub all skin surfaces thoroughly, being certain to include the web spaces between the fingers. Interlace the fingers and rub the palms together briskly.
3. Let solution drain off fingertips.
4. Dry hands thoroughly with paper towel.

NOTE

As soon as possible after washing the hands in a basin, wash hands with running water as described above.

Two-Basin Procedure

As an alternate procedure, and depending on local policy, two basins may be used, with one containing the germicidal-detergent solution; the other, water.

1-3. Follow steps 1 through 3 in one-basin procedure above.
4. Rinse hands with clear water.
5. Dry hands thoroughly with paper towl.

IMPROVISED HANDWASHING DEVICE (FIELD USE)

Improvised devices for washing hands in field conditions use the principles of running water, friction, and thorough rinsing. The simplest device uses a size 10 food can with perforations. Clean water is provided from a 5-gallon reservoir can. This method is described in FM 21-10.

5-7. Hospital-Acquired Staphylococcal Infection

Prevention and control of this type of infection require concerted effort and active participation of all hospital personnel. Strict attention to surgical asepsis, increased attention to the basic rules of medical asepsis and personal hygiene for patients and personnel, and improved methods of hospital housekeeping and environmental sanitation are the foundation of control and preventive measures. In the Army Medical Department, specific prevention and control measures are determined at the hospital administrative level by order of the hospital commander. An Infections Control Committee is appointed to collect data on all infections acquired within the hospital and to determine the nature of the problem. This committee evaluates all phases of hospital operations pertaining to the control of infections and sponsors a continuing educational program for all hospital personnel on the current concepts of proper prevention and control of infections. (Prevention and control of hospital infections are discussed in greater detail in TB Med 260.)

5-8. Cleanliness and Order In the Ward

The ward is the unit of the hospital in which a patient receives medical care and treatment and in which he also lives. It must be maintained as a safe, pleasant, clean, and orderly environment for his physical and mental well-being. Dust and debris, which harbor microorganisms, accumulate daily and in astonishing amounts when from 20 to 60 patients receive care in the limited area of the ward. Constant effort is needed to achieve and maintain the necessary high level of order and sanitation. Although the tasks involved are classified as "indirect patient care assignment," all of them contribute directly to high-quality patient care.

a. Appearance and Arrangement of Patient Unit Equipment. The patient's basic unit includes the bed, the bedside cabinet, and the chair. Arrangement in a uniform fashion (fig. 5-2) promotes the orderly appearance of a room or multiple-unit open ward.

(1) *Bed.* The standard gatch bed is placed away from the walls to allow movement on all four sides and accessibility to the patient occupy-

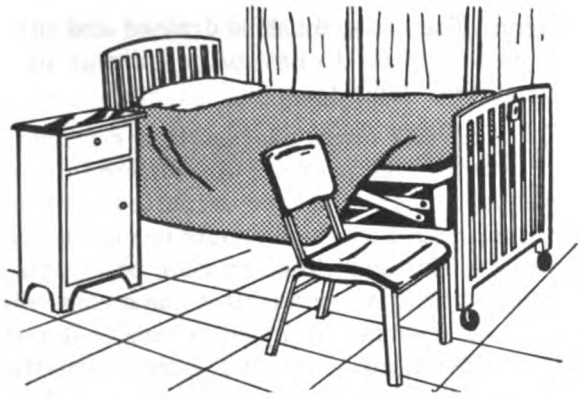


Figure 5-2. Arrangement of patient unit.

ing it. The spacing between beds is 5 feet in order to reduce the spread of respiratory disease. (An estimate of the required 5-foot distance can be made by remembering that the standard bedside cabinet is 20 inches wide—3 abreast equal 5 feet). When this spacing is impossible, the recommended preventive medicine procedure is to place beds head to foot. The large wheels on the gatch bed provide mobility when needed, but when the bed is stationary, the wheels must be turned in and locked to reduce hazards. The gatch handles are left in the down position after adjusting the bedframe.

(2) *Bedside cabinet.* The cabinet is placed to the patient's right unless contraindicated by patient needs. It is alined to the head of the bed when the bed is unoccupied but moved for patient accessibility p.r.n. Minimal required articles are kept on top; for example, water pitcher, glass, and tissue box. The movable rubber top provides a convenient device for securing the paper waste bag at each bedside. Personal articles such as pictures and table radios (when permissible) should be handled carefully tc avoid damage. Personal toilet articles are kept in the drawer; the robe and shoes, in the lower section.

(3) *Chair.* The chair is placed on the same side as the cabinet. Visitors at the bedside are requested to use chairs and are reminded, courteously, not to sit on the bed.

(4) *Floor.* The floor is clear, clean, and dry at all times. Anything dropped or spilled is cleaned up immediately. When custodial service is not provided for the ward, the wardmaster schedules the overall floor cleaning detail.

b. Ward Hygiene Measures.

(1) *Ventilation.* Free air circulation should be provided but patients should be protected from any draft (a direct air current blowing on an individual). Window ventilators are used, and window sills are kept clear of all other articles and free of dust. Air-conditioned units have central controls and thermostats.

(2) *Temperature.* A relatively constant temperature between 68 and 72 degrees is desirable.

(3) *Lighting.* Adjustable, swivel lamps are clamped to the head of the bed. The bulb should be 40 watts for safety. Overhead lights that glare into the patient's eyes should be avoided. Window shades should be adjusted. A standard gooseneck lamp is used at the bedside when additional light is needed for examinations and treatments.

(4) *Odors.* Odors are controlled by cleanliness, by prompt disposal of excreta and soiled dressings, and by proper ventilation. Body excretions leaking from drainage tubes or bottles to the floor must be cleaned up immediately. The use of deodorants to cover up unpleasant odors is not a recommended practice.

(5) *Noise.* Noise is controlled by orderly, quiet work habits. Banging metal equipment and loud talking must be avoided. Rubber heels are regulation, and no metal cleats are worn on them.

(6) *Privacy.* Doors, bed cubicle curtains, and portable screens are provided for privacy.

c. General Care of Ward Equipment. With few exceptions, equipment for ward use is durable, washable, and easily kept free of accumulations of dust, stains, body secretions, and rust. Corrosion-resistant metal and smooth-finished plastic items are used in preference to painted or enameled metal and fragile glass.

(1) *Routine cleansing.* Blood, urine, feces, and other body discharges must be rinsed off as soon as possible with cold water, as these substances contain protein which hardens on exposure to air or heat. They should then be washed thoroughly with hot, soapy water, followed by thorough rinsing with clear hot water to remove soap film. (Detergent-disinfectant solutions are often recommended for washing since they do not leave a soap film which would be incompatible with the chemical action of the disinfectant. Gritty scouring powder and strong cleaning compounds should not be used as they may scratch and roughen the smooth surface.) The clean surface should then be dried with a clean cloth or paper towel to prevent spotting or streaking.

(2) *Nonimmersible items.* These are wiped with firm strokes, using a damp cloth wrung out

of fresh, clean detergent solution, or when so recommended, out of a germicidal solution such as 70-percent alcohol. The surfaces and crevices are dried with a soft, clean cloth. Examples of nonimmersible items to be cleaned in this fashion are: flashlights; stethoscopes; blood pressure apparatus (note, however, that the cloth cuff is removable and washable); the cabinet assemblies of electrical equipment; irrigating stands; and other hospital furniture items. The wheels of wheeled equipment must also be washed and kept free of dust and debris.

(3) *Use of disposable or reusable items.*

(*a*) Disposable (one-time use) items such as catheters, syringes, needles, gloves, and preassembled catheterization sets are used for safety and economy of time and effort. They are available through CMS as standard items. Policies concerning the use of disposable medical materiel are prescribed in AR 40–23. Some key points in their use are as follows:

- Disposables are designed for a one-time use. Do not attempt to reuse or resterilize.
- Sterile disposables are sterile indefinitely providing the wrapper is not broken or torn.
- Supposedly sterile disposables with torn or broken wrappers must be discarded. They are *not* sterile.
- Disposables are designed for a specific purpose such as a catheterization tray. Do not use for a different purpose.
- Manufacturer's directions should be followed when using disposables.

(*b*) Army Medical Department personnel are expected to maintain a high degree of efficiency in the proper care and use of reusable medical materiel that is provided as basic unit equipment.

(4) *Sanitizing.* This term describes cleaning procedures that meet public health standards. Although a sanitized article need not be sterile, no harmful microorganisms should be present. Sanitization reduces the microbial level. Facilities on the average ward are adequate for sanitizing patient care equipment but not for sterilizing. Equipment to be sterilized is returned to CMS.

(a) The utensil boiler. This equipment is classified as a sanitizer, not a sterilizer. Previously washed and rinsed utensils are placed in the boiler, immersed completely, and boiled for 30 minutes. This is considered a reasonably safe method of disinfecting utensils for common use of patients. The boiler must be drained and the interior cleaned daily to prevent a build-up of scum and mineral deposits.

(b) The bedpan-urinal washer. This uses cold water under pressure for flushing away the contents of the bedpan or urinal and live steam for sanitizing. Personnel should be sure to release the foot pedal and close the door before pushing the flush valve. After flushing, the steam valve is turned on. Two minutes of exposure to live steam are considered adequate. If the automatic washer is not available, the contents are emptied into a toilet, the utensil is rinsed with cold water, and then scrubbed with a toilet brush and soap and water (or a detergent solution). The equipment is then rinsed and boiled for 30 minutes.

d. Use and Care of Ward Property. Property, as used in the Army Medical Department, encompasses all supplies, equipment, instruments, and other material having monetary value.

(1) *Economy.* It is the responsibility of each member of the patient care team to use supplies economically, to exercise care in using equipment, and to use property for the purpose for which it is intended. Use of good bed linen for cleaning rags, for example, is misuse of property and is contrary to the principles of supply economy and the cost consciousness program.

(2) *Maintenance and repairs.* The directions for use of equipment should be followed, including the necessary steps for operator preventive maintenance. Personnel should never attempt to make unauthorized repairs nor to use faulty equipment. Any part missing or not working properly should be reported to the wardmaster. He will see that it is properly tagged, that trained personnel are notified for required repairs, and that equipment in good condition is obtained through authorized supply channels.

e. Ward Cleanup and Storage Areas. The designated cleanup and storage areas on a ward should be used for appropriate purposes.

(1) *Utility room.* This room is equipped with a sink, hopper (a tub with a flush attachment for disposing of liquid wastes), bedpan and urinal washer, utensil sanitizer, and storage racks and cabinets. Washbasins, emesis basins, bedpans, urinals, waste receptacles, laundry hampers, and similar equipment are appropriately cared for and stored in the utility room. However, this room is not an appropriate area for storage of sterile supplies, water pitchers, glasses, or the ice machines.

(2) *Workroom.* This clean-up and storage area is usually adjacent to the utility room. Instruments, syringes, needles, trays, and similar equipment associated with sterile and clean treatment procedures are cleaned and stored in the workroom.

(3) *Water pitchers and glasses.* Although all water pitchers, glasses, and other drinking utensils are sanitized in dishwashing machines operated by food service, a proper storage point for clean items must be provided on a ward. The ice machine also requires similar attention. Since most wards no longer have a ward kitchen, these items are stored in a designated clean cupboard or alcove. A special area in the workroom may be appropriate. In some wards, a separate, small ward pantry is provided for the ice machine and drinking water equipment.

(4) *Linen room.* Clean linen is stored in a designated linen room, which is kept locked but accessible to authorized personnel. It is good practice to handle clean linen as little as possible when it is returned from the laundry. Linen should be placed neatly on the shelves and sorted as to variety (sheets, pillowcases, pajamas according to size, etc.) but not refolded.

5–9. Safety and Accident Prevention

a. Safety means freedom from danger or hazard. Safety in a hospital is attained through accident prevention. This, in turn, calls for maintaining safeguards for patients, duty personnel, and visitors. The safety of the patient must always be considered in giving patient care. This involves providing a safe environment, practicing safe work methods, and using equipment properly. Accident prevention is a responsibility shared by all members of the patient care team.

b. The main causes of hospital accidents are negligence by personnel, careless work habits, improper use of equipment, and use of faulty equipment. Most of these hazards can be avoided if all hospital personnel observe safety rules, practice safety measures, and recognize and eliminate, or report, hazards.

c. Following are ways to promote safety in the hospital environment:

(1) Keep floors clean, dry, and free of objects which might cause a person to fall. When washing or polishing floors, take special precautions to guard against falls.

(2) Keep corridors clear and well lighted.

(3) Keep working areas well lighted.

(4) Keep latrines lighted at night.

(5) Keep casters (wheels) and cranks of beds turned inward to prevent tripping on wheels and being injured by the cranks. Casters should be locked.

(6) Use care in handling sharp and pointed instruments and glassware. Discard razor blades, broken glass, and needles in designated containers.

(7) Do not use chipped and cracked glassware.

(8) Wrap glass connectors and glass tubing in a towel or protective gauze before twisting, pulling, or pushing them into rubber or plastic tubing. The glass connection and the tubing into which it is inserted should be of appropriate and matching diameters. Moisten both insertion points for ease in assembling. (Clean tap water is the recommended lubricant for nonsterile equipment. A sterile solution is required for sterile assemblies.)

(9) Never pour any material from an unlabeled container, and never pour stock solutions or cleaning compound solutions in containers bearing labels of other substances. Keep poisons in locked cabinets. (Poisons are always specially labeled by the pharmacy before they are sent to the ward.)

(10) Use proper body mechanics in moving and lifting objects.

(11) Report unsafe conditions to the proper personnel. On a ward or clinic, the senior NCO is a proper person.

d. Safety in handling patients and in carrying out treatments is most important.

(1) Take precautions to prevent patients from falling out of bed. Use bedrails, securely attached, on beds of young children, elderly patients, and patients who are restless or unconscious. Provide footstools and other assistance for patients having trouble getting into or out of bed. Keep the bedside table and call bell within easy reach of the patient. Warn him about the height and width of hospital beds. Lock the wheels of the patient's bed.

(2) Provide adequate support in lifting patients. Always get someone to help you when moving or lifting a heavy or a helpless patient.

(3) Take all necessary precautions when the patient is receiving oxygen (table 5–4).

(4) Test hot water bottles for temperature and leaks. Always cover these bottles.

(5) Give constant supervision to patients receiving treatment with heat lamps.

(6) Know how to use and care for equipment properly. Read all directions in the operator's handbook or manual accompanying the equipment.

(7) Take all necessary precautions when using electrical equipment. Examine the cords and the plugs of electrical appliances before using them. Arrange electrical cords so that there is no danger that any one will trip over them. Keep electrical equipment dry. Do not use faulty equipment; tag it and turn it in for repairs.

(8) Know and obey fire regulations. Practice fire prevention. Enforce smoking rules for patient and personnel. Never dim lights by covering them with a towel or with paper. Be careful when using flammable fluids such as ether. Discard oil or wax cleaning cloths in metal containers. Report gas odors immediately. Keep fire doors closed. Know the location and operation of fire extinguishers. Know the evacuation plan of the ward. Know how to report immediately the detection of any flame or smoke. It is customary to post the telephone number for FIRE on the telephone itself. (Personnel sometimes become so accustomed to seeing this number, they fail to notice it.) Even if a minor fire (such as in a waste container) is detected and extinguished immediately, report the fire so that a proper investigation can be made of its cause.

5–10. Cleaning a Patient Unit

This procedure is followed upon discharge or transfer of a patient. A similar procedure is required on a regularly scheduled basis for a long-term patient because over a period of time dust and germs will accumulate that concurrent (daily) cleaning does not control. Nursing service personnel are responsible for the following: bed, bedside cabinet, chair, overbed table (when used), lamp, and curtain or cubicle partition. When custodial housekeeping services are not available, the floor, window sills within the patient unit area, and adjoining bathroom are part of this unit-cleaning responsibility.

EQUIPMENT

Wheeled utility cart
Wheeled laundry hamper
Cleaning cloths
Wastebasket with paper bag or plastic liner
Basin of prescribed detergent-germicide solution

PROCEDURE

1. Assemble equipment in utility room and take to unit.
2. Clear bedside cabinet (overbed table if used). Check for any personal articles left by patient and turn them in to wardmaster. Place all utensils and any reusable treatment equipment on cart. Discard waste in wastebasket. Place any unused linen in unit in laundry hamper.
3. Strip bed. Remove pillow, placing pillow on chair and pillowcase in hamper. Lower bed gatch. Loosen bedding all around, walking around the bed and lifting the mattress edge to release linen without snagging on bedsprings. Check to see that no articles are concealed in linen folds. Roll each piece toward the foot of bed. Check pocket of discarded pajamas and bathrobe. Place all linen in hamper. (Fold woolen blankets, if used, and place on cart for special laundry.)
4. Clean bed. Wash top of plastic mattress cover, inspecting for any tears. Rinse cloth frequently and use damp but not dripping wet. Replace any damaged cover. Turn clean surfaces of mattress together, toward head of bed. Wash bottom half of bedspring, raising foot gatch and washing foot of bedframe and all crevices. Lower gatch. By grasping clean fold of mattress, lift and swing its clean side crosswise on clean half of spring (fig. 5–3) and wash exposed surface. Place pillow on unwashed upper half of spring. Wash top surface of pillow. Place pillow clean side down on clean mattress surface and wash other side. Wash upper spring, raising head gatch, to complete bed cleansing. Wash cabinet, inside

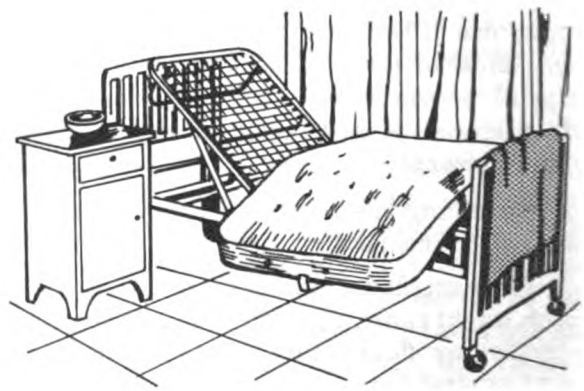


Figure 5–3. Cleaning the bedside unit.

and out. Complete unit cleaning by washing chair, bed lamp (cord unplugged), signal cord, and overbed table, if used. If responsible for floor, sweep and mop. Wash hands when cleaning is completed. Remake bed for a new occupant.

5. Discard waste. If cleaning cloths are to be reused, place in laundry hamper.
6. Wash collected utensils and place in sanitizer for a 30-minute boiling period. Wash utility cart and return to storage place.
7. Wash hands.
8. Remove clean utensils from boiler. Dry and return to storage shelf.

5–11. Bedmaking

a. Make all beds in a ward alike for uniformity of appearance. A well-made bed is neat, comfortable, free of wrinkles, and readily adaptable to the specific needs of an individual patient.

b. Use good body mechanics (section 3) when making beds and make each movement purposeful to conserve time and motion.

c. Handle all linen so as to reduce dust and spread of microorganisms. Do not shake or fan out clean or soiled linen. Hold soiled linen away from uniform and place in laundry hamper, not on the floor.

d. Provide clean blankets for each new hospital patient. Use cotton blankets for safety and economy of laundering.

e. Following Army Medical Department policy, use plastic protective cover on all mattresses and pillows. Add a rubber or laminated cotton drawsheet to protect the bottom or foundation sheet p.r.n.)

f. When standard cotton bedspreads are not available, use a top sheet as a blanket cover.

5–12. Unoccupied Closed Bed

This is a bed made after terminal cleaning of a bed unit. The top covers are not folded back in order to maintain clean inner surfaces.

EQUIPMENT

Cotton blanket, 1
Sheets, 2 (or 3 when one is used as a spread)
Pillowcases, 1
Bedspread (when available)

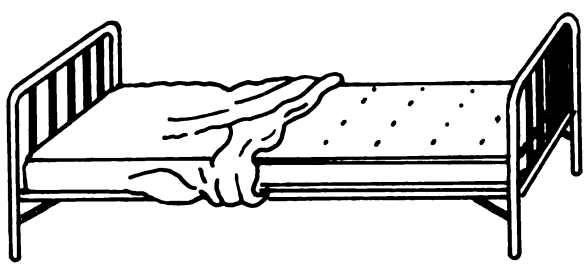
PROCEDURE

General Steps

1. Check to see that plastic mattress cover and plastic pillow cover are in good condition. Replace p.r.n.
2. Obtain clean linen from linen closet. Place in order of use on chair—pillow, pillowcase, spread, blanket, and sheets on top.
3. Move bedside cabinet out of the way. Place chair to one side.
4. Adjust gatch to level position. Turn bed crank handle in. Turn swivel lamp back and up out of the way.
5. Push mattress to head of bed.
6. Tighten mattress cover from the head of the bed toward the foot of the bed to smooth out all wrinkles.

MATTRESS COVER (PLASTIC OR COTTON)

Fold cover back on itself. Place top corner of mattress into cover, far corner first, flap of cover on top of mattress. Pull cover down on mattress, working each side alternately. Fold under excess at foot. Smooth out cover. Tighten at sides.

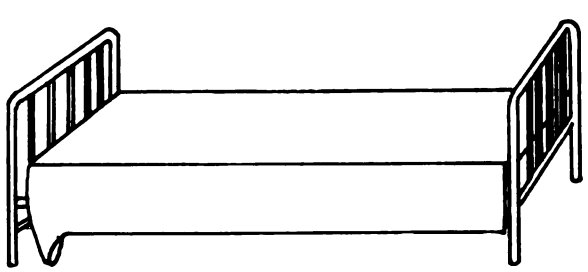


MAKING BED

Make bed in following steps, completing one side before going to the opposite:

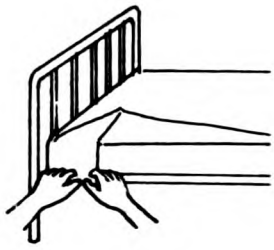
Bottom Sheet.

Step 1. Place bottom sheet on mattress. Center lengthwise, fold at midline, hem seam down, bottom hem even with foot edge. Unfold sheet across bed. Tuck surplus under head of mattress. Pull excess sheet taut and smooth over top edge of mattress, tightening it from underside of mattress.

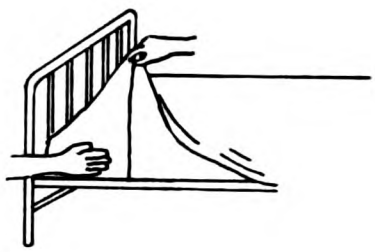


Step 2. To miter the corner, pick up hanging side of sheet edge about 12 inches from head of mattress. Lay back on mattress in a triangle fold.

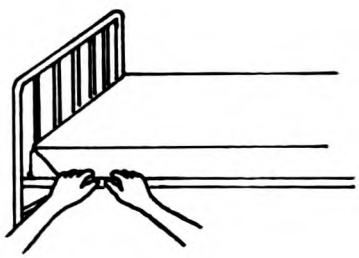
Step 3. Tuck hanging corner of sheet under mattress, holding hands palm down to protect knuckles from bedspring.



Step 4. Place hand at side of mattress and even with top edge. Bring triangle fold down over hand to insure firm, smooth mitered corner.

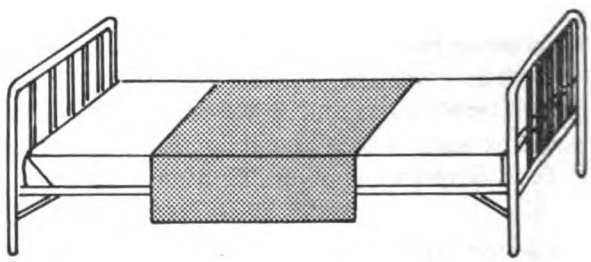


Step 5. Tuck sheet under mattress working from top to bottom. If mitered properly, sheet will be smooth and neat when bed is occupied and when gatch is elevated.

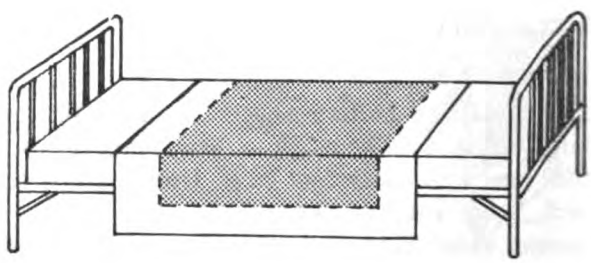


To Protect Bottom Sheet p.r.n.—

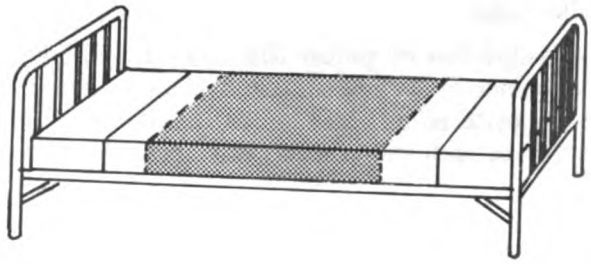
- Add standard laminated cotton protective sheet. (Use rubber sheet when this is not available.) Place protective sheet over bottom sheet so that middle third of bed is covered. Tuck it under mattress on side of bed.



- Add cotton draw sheet. The draw sheet is a large sheet folded in half, hem to hem, smooth side of hem on outside. Place folded edge toward head of bed, centering sheet on bed and overlapping protective sheet by 2 or 3 inches at top and bottom.

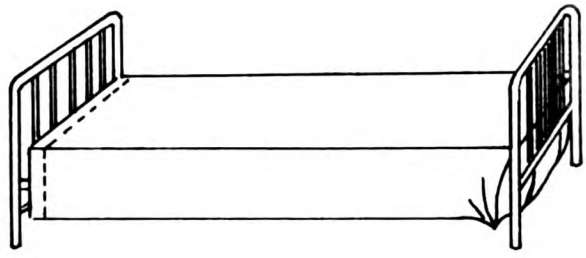


- Tuck sheet smoothly under the side of the mattress.

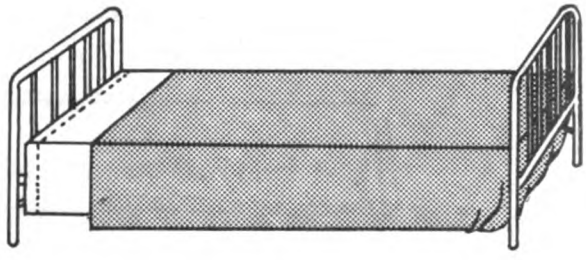


Top Sheet

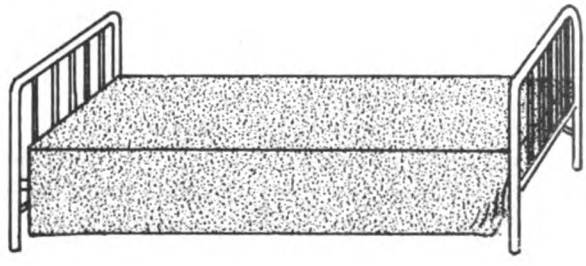
Step 6. Center top sheet on foundation, hem seam up, even with head edge of mattress, surplus at foot.



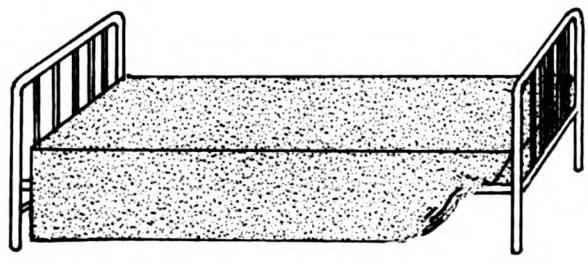
Step 7. Center blanket with edge approximately 8 inches (one handspan) from head edge of mattress, surplus at foot.



Step 8. Center spread (or sheet) with edge even with head of mattress, surplus at foot.



Step 9. Place hand under foot end of side of mattress to hold foundation sheet taut while raising mattress slightly. Smooth and tuck top sheet, blanket, and spread under foot of mattress. Miter corner. Leave side of top covers hanging free.



Step 10. Go to opposite side of bed and complete bed making.

- In sequence, fold back the spread, blanket, top sheet and, if used, the drawsheet and protective sheet, to the center of the bed.
- Smooth and straighten the foundation sheet, mitering the top corner and pulling the sheet taut while tucking the side under the mattress from head to foot. If used, pull the protective and draw sheets taut and tuck under the mattress.
- Bring over the top covers in succession. Tuck under at foot and miter corner.
- Do not form a cuff unless bed is being prepared for patient occupancy—the closed bed is then an "open bed." Fold top edge of spread under the blanket edge, bring top sheet over to form a cuff, and fanfold bedding down toward the foot.

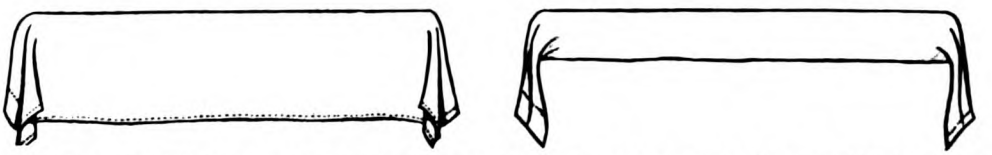
Pillowcase

Put pillowcase on pillow (fig. 5–4). Fit pillow into the corner or on one side and pleat excess under at opposite side. Place pillow neatly at head of bed, with open end of case away from the door.

Figure 5–4. Putting on a pillowcase.

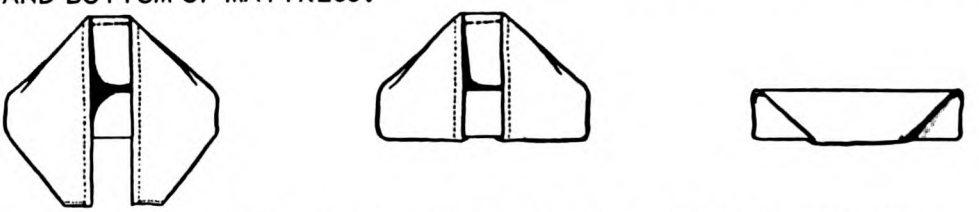
FOLDING COT

This cot may be used in the field. It is narrower than the standard hospital gatch bed, and a lightweight pneumatic (air-filled) mattress may be used with it. The cot may be made with envelope corners (fig. 5–5), which will anchor the sheet under the narrow, lightweight mattress better than mitered corners. The envelope corner is recommended also for the foundation sheets covering the wheeled litter and the child's crib mattress.

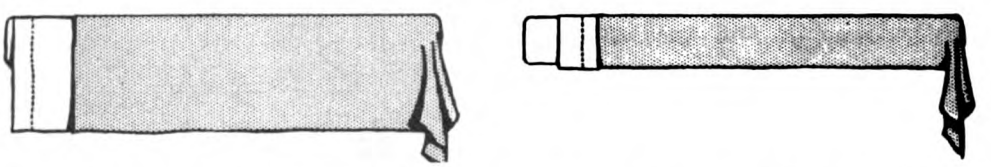


1. BOTTOM SHEET--CENTER FOLD AT CENTER OF COT SMOOTH SIDE UP. EXCESS SHOULD BE EVEN AT TOP AND BOTTOM OF MATTRESS.

2. TUCK FAR SIDE UNDER MATTRESS. TUCK NEAR SIDE UNDER MATTRESS.

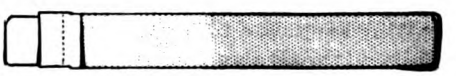


3. MAKE ENVELOPE CORNERS AT TOP AND BOTTOM OF MATTRESS.



4. TOP SHEET--CENTER FOLD AT CENTER OF COT SMOOTH SIDE DOWN, HEM EVEN WITH TOP OF MATTRESS.
BLANKET--CENTER FOLD AT CENTER OF COT 6" FROM TOP OF MATTRESS.

5. MAKE 6" CUFF OF SHEET OVER BLANKET. TUCK IN SHEET AND BLANKET FARSIDE. TUCK IN SHEET AND BLANKET NEARSIDE.



6. MAKE ENVELOPE CORNER AT FOOT OF MATTRESS.

Figure 5–5. Making a cot.

5–13. Occupied Open Bed

This procedure is followed for routine daily bed making when the patient is out of the bed. Linen is changed as required, in accordance with local ward policy.

EQUIPMENT

Daily allowance of clean linen (may be 1 sheet, 1 pillowcase, 1 towel, and 1 washcloth, or in accordance with linen-control policy)
Washbasin containing detergent-germicide solution
Cleaning cloth
Clothes hamper
Paper bag

PROCEDURE

1. Check unit for clean linen. Obtain clean linen as required.
2. Assemble materials at bedside, placing clean linen in order of use on chair. Move bedside cabinet and chair out of the way, and adjust bed to level position. Turn bed crank handle in.
3. Strip the bed and tighten mattress cover, from head to foot. In stripping a bed:

- Remove soiled pillowcase and place in clothes hamper. Place pillow against chair back.
- Loosen all linen while moving around bed, raising mattress slightly and lifting linen edges free. Do not tug linen and snag on springs.
- If any item of linen is to be reused, fold linen as it is removed from the bed; place this linen on the chair seat. Roll soiled linen as it is removed; place this linen in the clothes hamper.

CAUTION

Avoid letting soiled linen touch your clothing or the floor. (If linen hamper is not available within or adjacent to the bed unit, hang the used pillowcase on the back of the chair to receive soiled linen.) Carefully fold or roll linen off the bed to avoid fanning it in the air.

4. Complete bed foundation and top covering, steps 1 through 10, paragraph 5–12. Form a cuff and fanfold top bedding half-way to foot of bed (fig. 5–6).
5. Replace pillowcase and pillow.
6. Damp-dust bed cabinet, bedframe, and chair.
7. Realine bed, bed cabinet, and chair. Turn bed wheels in and lock.

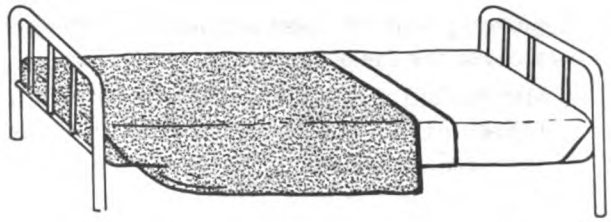


Figure 5–6. Final step for occupied bed.

8. Hang clean paper bag by securing tab edge between surfaces of bed cabinet top. Tear down sides of bag to form 2-inch tabs. Fold the three sides outward to form a cuff. (The fourth side is the hanger). Folding in this manner provides clean surfaces for handling.
9. Leave unit clean, orderly, and ready for occupancy. Check to see that lamp and signal cord are replaced for patient use.
10. Discard waste. Wash and sanitize washbasin.
11. Wash hands.

5–14. Patient Occupied Bed

Changing bed linen and making a neat comfortable bed while it is occupied by a patient usually follows the completion of a cleansing bed bath. It provides excellent opportunity for patient-centered conversation and for instructing the patient how to move, turn, conserve energy, and maintain good body alinement. If the patient is unconscious or helpless, two individuals should work together. The assistant helps to turn and hold the patient. The operator gives instructions and performs the procedure. When an assistant is not available to help turn and hold a helpless patient, the side rails of the bed opposite the operator must be raised and latched in position to protect the patient from rolling out of bed.

EQUIPMENT

Sheets, 2
Protective sheet p.r.n.
Cotton drawsheet p.r.n.
Pillowcase, 1
Clothes hamper

PROCEDURE

1. Remove pillow. Lower bed gatch for a level bed if allowable.
2. Loosen bed linen while moving around bed, raising mattress slightly and lifting linen edges free. Do not tug linen and snag on springs.
3. Pull mattress up to head of bed p.r.n.

4. Remove spread and blanket, leaving top sheet as a cover for the patient.
5. Assist patient to turn toward you, to side of bed, keeping his body covered with the sheet. If required, raise and latch bedside when patient's position has been adjusted.
6. Go to opposite side of bed. Place chair in convenient location.
7. Roll all bedding in layers close to the patient's back. Smooth and tighten mattress cover from top to bottom.
8. Place clean foundation sheet on exposed section of mattress, hem seam down, center fold in midline of bed, folded against patient, bottom edge even with foot of mattress. Tuck under top edge, miter corner, smooth and tuck side under, moving from head to foot.
9. Replace protective sheet, if used. Hold linen folds in place in center of bed with one hand, and bring rolled protective sheet back over linen folds to clean foundation. Place clean cotton drawsheet over protective sheet, rolling excess folds toward patient. Smooth and tuck under the sides of both sheets to complete near side of foundation.
10. Tuck all linen folds under patient as smoothly as possible. Assist patient to roll over linen folds to the clean foundation side.
11. Secure side of bed, if needed, before going to opposite side of bed.
12. Go to opposite side of bed. Pull rolled linen through. Keep clean linen close to patient's back; remove soiled linen. Tighten mattress cover, head to foot. Complete foundation.

NOTE

If protective sheets (or a drawsheet only) are used, pull taut and wrinkle free by tightening center portion first, then upper and lower ends.

13. Turn patient to center of bed. Center clean top sheet over patient. Instruct patient to hold clean top sheet while you remove soiled sheet from underneath, pulling gently from top to bottom. Place soiled sheet in clothes hamper.
14. Replace blanket and spread, instructing patient to dorsiflex feet to be sure top bedding is loose enough before tucking under and mitering corners at the foot.
15. Complete cuff at head of bed. Fold down top bedding to level comfortable for the patient.
16. Place clean case on pillow. Replace pillow. Adjust bed gatch as needed. Adjust sides of bed as needed.
17. Place bedside cabinet and signal within patient's reach.
18. Damp-dust unit. Attach clean paper bag. Hang clean towels and washcloth in proper place.
19. Remove all unnecessary equipment and articles from unit. Leave unit clean and orderly.
20. Return clothes hamper to storage area. Discard waste. Wash and sanitize equipment that is returned to utility room. Wash hands.

Section III. APPLICATION OF BODY MECHANICS

5-15. Body Posture and Body Mechanics

The medical specialist must know how to use his own muscles in order to instruct his patients how to use theirs. The combination of good posture and the use of proper body mechanics benefits both personnel and patients. The benefits include making the most efficient use of muscles, promoting normal body functions, avoiding strain and fatigue, and preventing deformity.

a. Posture. Posture is body alinement, the relative position of body parts standing, sitting, lying down, or participating in any other type of activity. Posture determines the distribution of body weight and the consequent pull on muscles and joints. It affects the size and shape of body cavities, which, in turn, affect the position of the viscera. Body functions of circulation, respiration, digestion, and joint action are directly affected by posture. Good posture is body alinement which favors normal function and which requires the least strain to maintain.

(1) *In standing position.* Back should be straight; feet firmly on the ground, about 4 to 6 inches apart to give an adequate base of support, with the toes pointing straight ahead or slightly toed out; head and rib cage held high; chin, abdomen, and buttocks pulled in; and knees slightly bent.

(2) *In sitting position.* Back should be straight, with weight resting equally on buttocks and under surface of thighs (not on the base of the spine).

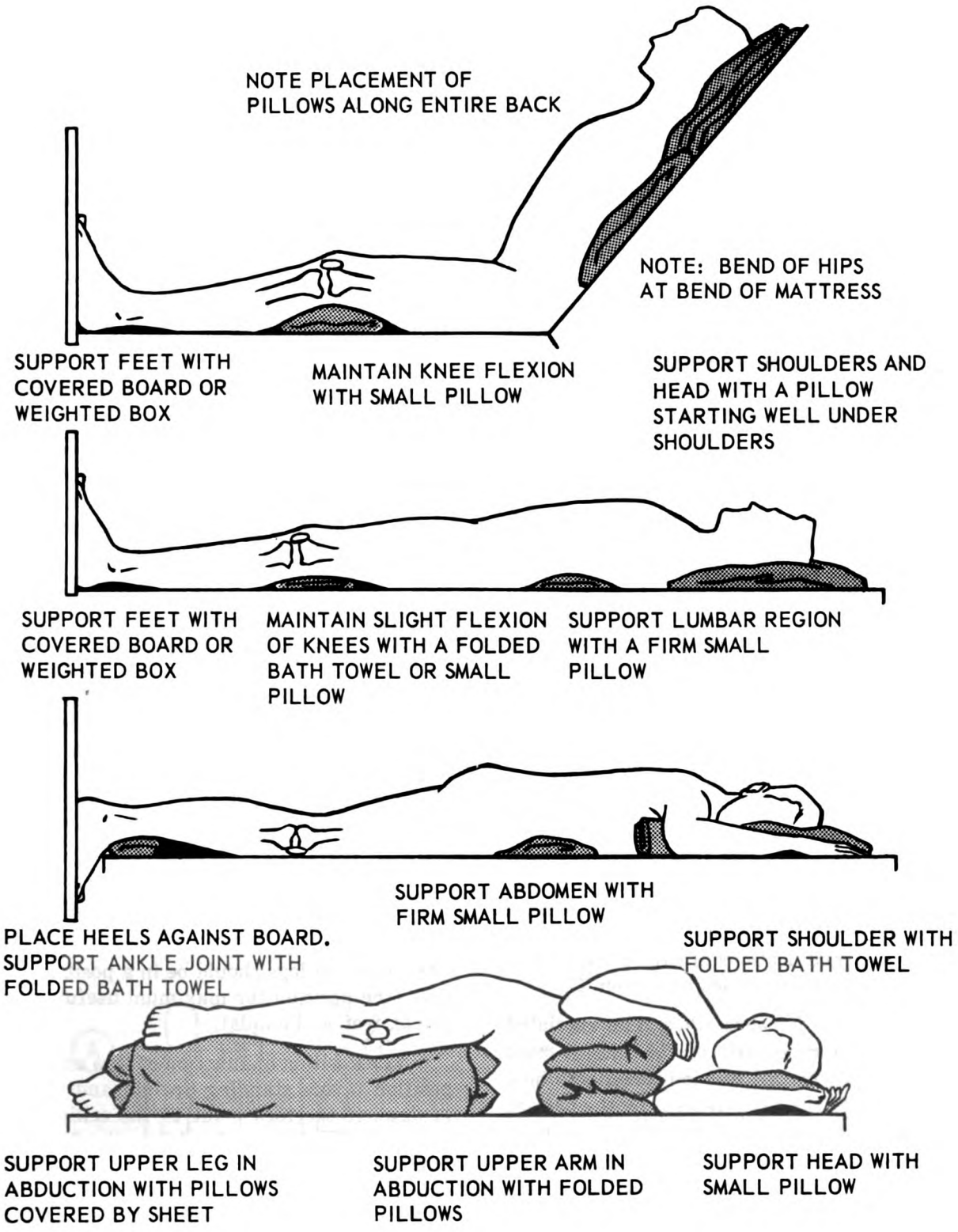

NOTE PLACEMENT OF PILLOWS ALONG ENTIRE BACK
NOTE: BEND OF HIPS AT BEND OF MATTRESS
SUPPORT FEET WITH COVERED BOARD OR WEIGHTED BOX
MAINTAIN KNEE FLEXION WITH SMALL PILLOW
SUPPORT SHOULDERS AND HEAD WITH A PILLOW STARTING WELL UNDER SHOULDERS
SUPPORT FEET WITH COVERED BOARD OR WEIGHTED BOX
MAINTAIN SLIGHT FLEXION OF KNEES WITH A FOLDED BATH TOWEL OR SMALL PILLOW
SUPPORT LUMBAR REGION WITH A FIRM SMALL PILLOW
SUPPORT ABDOMEN WITH FIRM SMALL PILLOW
PLACE HEELS AGAINST BOARD. SUPPORT ANKLE JOINT WITH FOLDED BATH TOWEL
SUPPORT SHOULDER WITH FOLDED BATH TOWEL
SUPPORT UPPER LEG IN ABDUCTION WITH PILLOWS COVERED BY SHEET
SUPPORT UPPER ARM IN ABDUCTION WITH FOLDED PILLOWS
SUPPORT HEAD WITH SMALL PILLOW

Figure 5–7. Positions for patient's comfort and body alinement.

b. Body Mechanics. This is the coordinated use of body parts to produce motion and to maintain balance. The use of good body mechanics promotes the efficient use of muscles and conserves energy. The following principles apply to any moving or lifting activity:

(1) Face the direction of movement.

(2) Use large muscle groups of the legs, arms, and shoulders to lessen strain on back and abdominal muscles.

(3) Bring the object to be lifted or carried as close to the body as possible before lifting. (This keeps both centers of gravity close together.)

(4) Bend the knees and keep the back straight when leaning over a work level.

(5) Kneel on one knee, or squat, and keep the back straight when working at floor level.

(6) Push, pull, slide, or roll a heavy object on a surface to avoid unnecessary lifting.

(7) Obtain help before attempting to move an obviously unmanageable weight.

(8) Work in unison with an assistant. Give instructions and agree on the signal to start the activity.

5-16. Moving and Positioning the Bed Rest Patient

a. Importance. Purposeful movement and positioning of a patient who is on prescribed bed rest is necessary to maintain good posture and to preserve and restore normal body function. While bed rest is an important part of treatment, a patient cannot be allowed to lie motionless and in any one position for extended periods of time. The nursing care of a patient in a standard hospital bed is discussed here; modifications of care when a turning frame is used are discussed in section XI.

b. Nursing Care Responsibility. The specialist responsible for nursing care of the patient must know the reason why bed rest is ordered and how much physical effort and movement by the patient is allowable. If the patient is unable to move himself, he must be moved and repositioned at least every 2 hours day and night. If the patient is able to move himself, he must be encouraged to do so and must be checked to see that his movements are purposeful and that his posture is good.

(1) Tell the patient what is to be done and how it is to be done in order to use proper body mechanics.

(2) Plan several alternate positions (fig. 5-7) to provide comfort, support, and good body alinement. A patient with a painful disorder is understandably reluctant to change a position that seems to be comfortable. He, therefore, tends to favor a position that usually involves minimum movement. Continued favoring of this position may result in contracture deformity. This is a shortening of the normal range of a joint movement and is very disabling. The continuous use of the head and knee rest, for example, favors development of contractures at the hip and knee. An effective preventive position is flat on the abdomen, legs extended, feet over the edge of the mattress, toes pointing to the floor. This is a position a patient seldom places himself in voluntarily.

c. Modifications of Bed Rest Positions. These include supine (back-lying), prone (front-lying), lateral recumbent (on either side), and Fowler's position (semiupright with back and knee rests elevated), plus being lifted from bed to sit in a chair. All of these position changes provide alternate weight-bearing surfaces to relieve pressure, improve circulation, and preserve muscle function as different muscle groups contract and relax. The patient will actually look and feel better as he gains strength and self-confidence.

d. Body Alinement in Bed. The following points should be checked to insure good body alinement, whether the patient is lying on his back, abdomen, or side:

- Head in midline with the trunk.
- Back straight, with normal body curves (cervical, thoracic, and lumbar) maintained.
- Ribs elevated to prevent constriction of the chest.

The arms and legs should be in a position of function (the position for maximum usefulness of the joints, feet, and hands).

(1) Position of function of legs and feet. This position favors standing upright and walking. In general, if the toes point to the ceiling when in back-lying position and point to the floor when in front-lying position, the feet, legs, and hips are in good alinement.

(2) Position of function of arms and hands. This position favors raising the arms and grasping things with the fingers. The hand should not droop at the wrist, be clenched in a fist, or be flat. The position of function for the hand is dorsiflexion (at a slight upward angle) at the wrist, with

the fingers and thumb in position to write with a pencil.

5–17. Safety in Moving and Lifting Activities in Patient Care

The use of body mechanics enables the medical specialist to perform moving and lifting activities while avoiding back strain. The methods described apply to moving patients (or objects of similar weight) while standing at a hospital bed working level.

a. Preparation of Body for Lifting Movement. Before starting to move or lift a patient or an object, prepare your body for the lifting movement as follows:

(1) Stand with feet apart, one foot advanced (fig. 5–8 Ⓐ), facing the side of the bed.

(2) Lower body to working level by flexing the knees while keeping the back straight (fig. 5–8 Ⓑ).

(3) Lean forward and slide arms under the patient, keeping the elbows close to the body, and the back straight.

(4) Set pelvis for moving the patient by tensing (constracting) simultaneously the abdominal and gluteal muscles (fig. 5–8 Ⓒ).

b. Movement of the Patient.

(1) To move the patient toward you, let the arms holding the patient slide on the surface toward you while shifting your weight backward from front to rear foot (fig. 5–9 Ⓐ).

(2) To move the patient away from you, let the arm holding the patient slide on the surface away from you while you shift your weight forward from rear to front foot (fig. 5–9 Ⓑ).

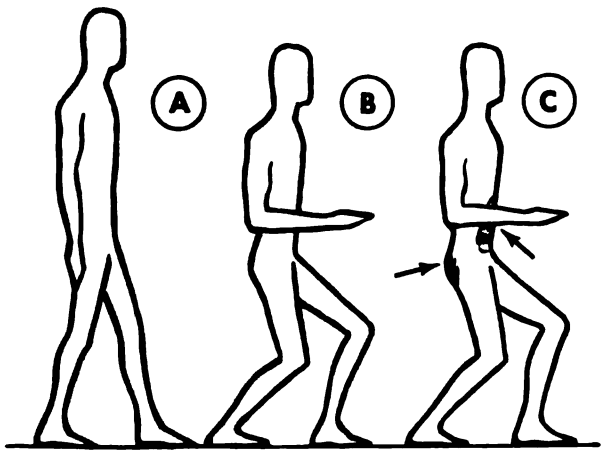


Figure 5–8. Body in correct position for moving or lifting.

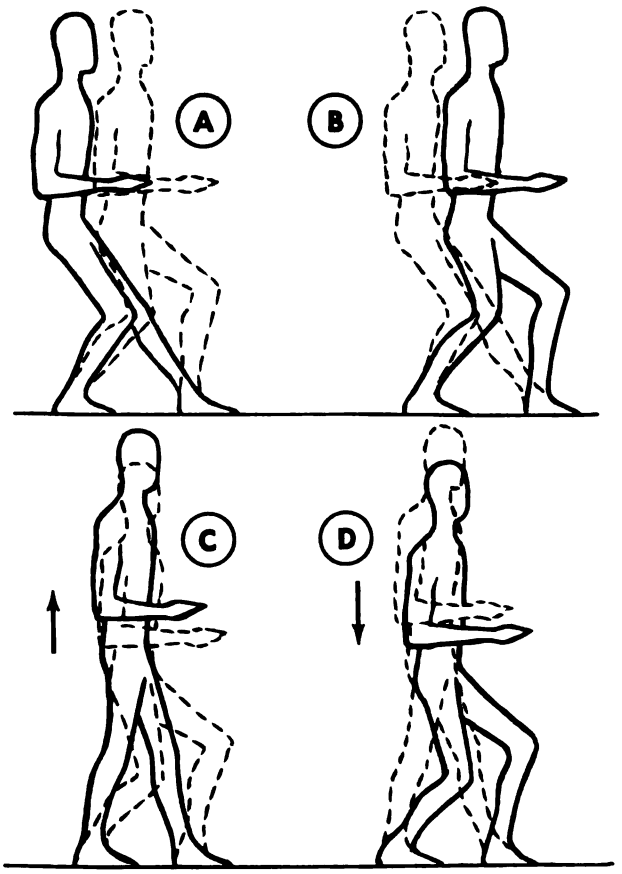


Figure 5–9. Body in motion when moving or lifting.

(3) To lift the patient, first move the patient toward you. This keeps the centers of gravity close together. Keeping elbows close to your body, straighten your knees to equalize weight on both feet (fig. 5–9 Ⓒ). Support the weight of the patient against the chest as you shift your weight backward.

(4) To lower the patient to the bed surface, flex the knees to lower your body to working level (fig. 5–9 Ⓓ). Shift your weight forward as you lower the patient to the bed surface.

5–18. Methods of Moving and Positioning Patients in Bed

a. General. Application of the principles of body mechanics provides safe, efficient, and comfortable means of moving and positioning patients who can and cannot assist themselves. Preparation for these procedures includes—

(1) Knowing what the patient can do and should be encouraged to do in order to assist. Check doctor's orders and nursing care plan card.

(2) Telling the patient exactly what is to be done and what he can do to help.

(3) Obtaining necessary equipment and arranging it conveniently at the bedside.

(4) Obtaining necessary assistance before trying to move an unmanageable patient.

(5) Starting with the bed flat (if tolerated by patient) and with the bed wheels locked.

b. Moving a Patient Up in the Bed. There is a tendency for the mattress and the patient to slip down when the head of the bed has been elevated. Lower the head gatch to level position and move the mattress up before repositioning the patient, as free space at the foot of the bed is needed to adjust bedding.

(1) *To move the mattress up.* This procedure is used when the patient can assist; stand behind the head of the bed and grasp mattress; flex knees slightly, advancing one foot; tell patient to bend knees and to raise buttocks off the bed on signal; give signal, brace forward thigh against bed and slide mattress and patient up. If patient cannot assist, ask for help. Instruct the assistant to stand at the opposite side of the bed and grasp the mattress. On signal, slide mattress and patient up.

(2) *To move the patient up.* Pull pillow upright; tell patient to reach back and grasp the bars at the head of the bed and bend his knees; slide one arm under the patient's shoulders and the other arm under his buttocks (fig. 5–10); on signal, have the patient pull with his arms and push with his feet while you slide him upward.

NOTE

When patient cannot assist, the assistant and specialist, standing on opposite sides of the bed, slide their arms under the patient's back and thighs, and in unison, both shift their weight and slide the patient up.

(3) *To use a drawsheet.* A drawsheet may be used to help move a helpless patient. An assistant is needed. Loosen the sheet and roll close to either side of the patient's body. In unison, grasp the rolled sheet and slide sheet and patient upward. Then smooth the loosened sheet free of all wrinkles, tighten, and tuck under the sides of the mattress.

c. Assisting a Patient to Raise Head and Shoulders. This procedure is used to remove or to replace the pillow or to assist the patient into a sitting position. Stand facing the head of the bed with one foot advanced. Slip arm nearest patient under his axilla and brace this hand against the back of his shoulder. Tell him to bend his knees to relieve strain on his abdominal muscles and to brace the hand of his supported arm against your shoulder. By linking arms, you and the patient make use of shoulder and chest muscles to lift body weight (fig. 5–11 Ⓐ). This linking of arms provides mutual support. At the given signal, raise his back and shoulders by shifting own weight from front to rear foot. Use free hand to support his head or to remove or replace the pillow.

Figure 5–10. To move a patient up in bed.

d. Moving a Patient to the Side of the Bed. Bringing a patient close to the side of the bed brings both centers of gravity closer, so all other moving and turning procedures will require less strain. When working alone, move the patient's body part by part: To move upper body, slide one arm under his head and shoulders and one arm under his back; then slide his upper body toward you. To move lower body, slide one arm under his hips and one under his thighs, then slide lower body toward you. Realine shoulders, hips, and legs.

e. Turning a Patient on His Side. When working alone, always turn the patient toward you. Stand on the side of the bed toward which the patient is to be turned. Flex his knees toward you. Place one hand on his far shoulder and the other on his far hip. Bracing your body against the side of the bed, gently roll the patient toward you. Now go to the opposite side of the bed. Slide arms under the patient's hips and draw his hips toward you, toward the center of the bed. Flex his upper leg forward on his extended lower leg to prevent him from rolling backward. Check shoulder aline-

Figure 5–11. Moving and positioning a patient.

ment. His lower arm should be in front of his chest or extended along his back, but not caught under his body (fig. 5–11 Ⓑ). Return to original side of the bed. Arrange pillow to support head. Use two additional pillows to support upper arm and upper leg to maintain shoulder and hip alinement.

5–19. Body Mechanics in an Arms-Carry Lift From Floor to Bed Level

There will be occasions in both field and fixed hospital situations when a patient must be lifted from the floor to a bed or wheeled litter. A minimum of three bearers is necessary for a heavy patient but two bearers may be adequate for lifting a light-weight patient. The bearer lifting the patient's head and shoulders instructs the patient and gives all commands. The sequence of the steps in the procedure are safety factors. Each step promotes distribution of both bearer's and patient's weight and protects the bearer's back from strain while lifting and rising from floor to bed level. The medical specialist who knows how to use his own muscles can thus concentrate on the safety and comfort of the patient.

PROCEDURE

(fig. 5–12)

1. Place the bed or stretcher to receive a patient lifted from the floor at the far side of the patient and parallel to him. Lock the wheels of the bed or stretcher. All bearers kneel on the knee nearest the patient's feet. Each bearer slides his arms under the patient at a space interval which allows the bearer's elbows to be held close to his body, while supporting the patient's shoulders, back, hips, and thighs.
2. At the command, all lift in unison, shifting weight backward, and carrying the patient to a support position on their braced thighs (the thigh toward the patient's head).

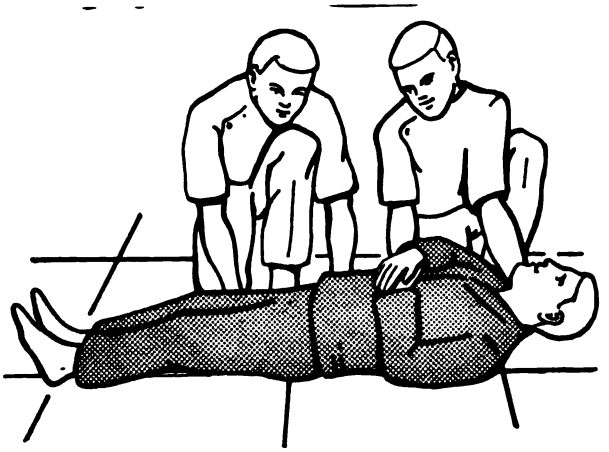


Figure 5–12. Arms-carry lift from floor to bed level.

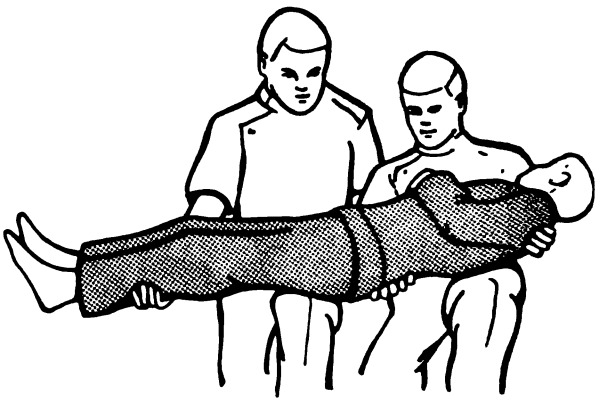


Figure 5–12—Continued

3. At the command, all lift and turn the patient inward toward their chest, while with back straight, all rise to standing position.

NOTE

This is a key maneuver for proper weight distribution. Attempting to rise to a standing position while supporting the patient's weight on the outstretched forearms will cause a severe strain.

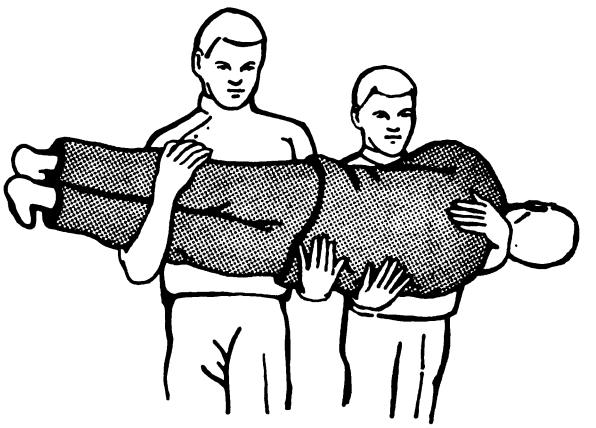


Figure 5–12—Continued

4. To lower a patient to a bed placed parallel, all step forward to the side of the bed. Flexing the knees, shifting the weight to the front foot, and keeping the back straight, lower the patient gently to the bed.

5–20. Assisting the Patient Out of Bed

"Out of bed" may be for transportation only or it may be a series of progressive changes in posture

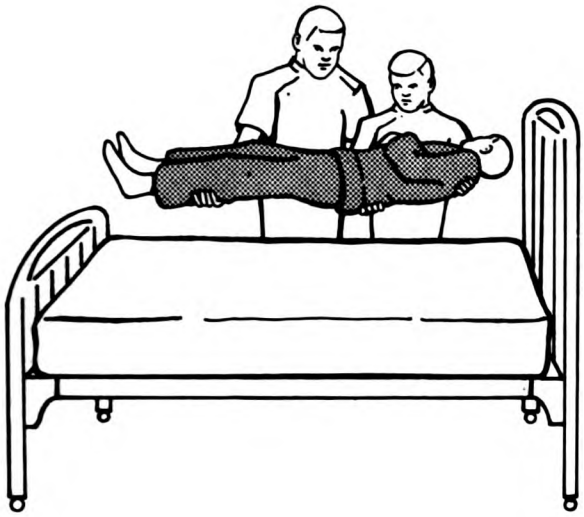


Figure 5–12—Continued

and activity for a bed patient. As in any movement or position change, find out in advance how much activity is permissible and encourage the patient to assist himself within those limits.

MOVEMENT FROM BED TO CHAIR

This usually represents the first change of a bed patient from a supine to an upright position. All movements must be deliberate to allow for neurocirculatory adjustments. Check pulse, respiration, and skin color before moving the patient and again after he is settled comfortably in the chair. Watch for dizziness, faintness, and fatigue. The first time up usually lasts no longer than 30 minutes and, unless otherwise specified, is combined with ambulation.

1. Check the patient's pulse, respiration, and skin color before moving.
2. Place the chair parallel to the side of the bed and toward the foot. If wheelchair is used, brace the wheels and move footrests to one side. If a blanket is needed, place open blanket in chair.
3. Fold covers to foot of the bed.
4. Assist the patient, dressed in pajamas, to sit upright and to pivot his legs over the edge of the bed.
5. Assist patient into bathrobe. Place slippers on feet. Allow him to feel balanced and secure while sitting upright.
6. Stand facing the patient. Place hands on either side of his waist and tell him to place his hands on your shoulders (fig. 5–13). Supporting him in this position, assist him to step down from bed to stool and from stool to floor.

Figure 5–13. Assisting patient into an upright position.

7. Stand upright and face the patient while he supports himself on your shoulders and balances himself in an upright position.
8. Side-step together and pivot (fig. 5–14) into position for seating him well back on the chair seat. Support him with one arm and hold the chair steady as he lowers himself. If a wheelchair is used, adjust the footrests and set the brakes, or brace the chair against a support. Fold blanket, if needed, around patient and tuck ends in to prevent catching in wheels.

Figure 5–14. Position for pivoting patient.

9. Straighten or make the bed as soon as the patient is settled comfortably. Fold covers to foot in preparation for his return to it.
10. Check his pulse, respiration, and skin color.

Lifting a Patient to a Chair

A patient unable to stand upright is transferred to a chair by a 2-man, 4-hand carry (fig. 5–15). This procedure is recommended for lifting a patient to a bedside commode or lifting a patient with foot injuries to a chair.

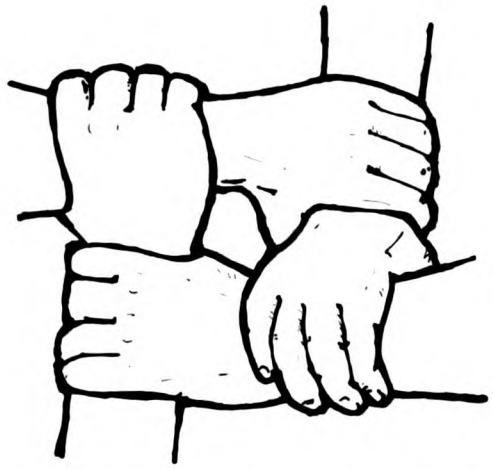


Figure 5–15. Two-man, four-hand carry.

1. Check the patient's pulse, respiration, and skin color.
2. Sit the patient upright on the side of the bed.
3. Standing on either side of the patient, interlock hands to form a seat for the patient. Tell the patient to support himself by placing an arm around each neck.
4. Carry the patient to the chair and lower him on to the seat.
5. Check his pulse, respiration, and skin color.

MOVEMENT FROM BED TO STRETCHER

One to three assistants are needed, depending upon the size, weight, and condition of the patient.

Using a Drawsheet

1. The patient is moved to the side of the bed. The drawsheet is loosened and rolled close to the patient.
2. The stretcher is placed parallel to the patient's side of the bed, with bed wheels and stretcher wheels locked.
3. If two assistants are available, they should both stand at the far side of the stretcher, lean over and each assistant grasp the drawsheet with one hand. The assistant nearest the patient's head should slip his free hand under the patient's head and shoulders for support. The second assistant should use his free hand to support the patient's legs. If three assistants are available, one assistant should stand at the head of the stretcher and prepare to support the patient's head and shoulders. The second assistant should stand at the far side of the stretcher, lean over, grasp the drawsheet and prepare to lift. The third assistant should be at the foot of the stretcher and prepare to support the patient's legs. At a signal, all lift in unison, shifting weight to transfer the patient to the stretcher (fig. 5–16).

NOTE

The drawsheet is usually left in place under the patient to return the patient to bed.

Figure 5–16. The drawsheet lift from bed to stretcher.

Using a 3-Man Carry

1. The stretcher is placed at a right angle to the bed with its head toward the foot of the bed. The patient is moved to the corresponding side of the bed, while bearers stand parallel to the bed.
2. Number 1 man slides his arms under the patient's head and shoulders; number 2 man, under the patient's chest and buttocks; number 3 man, under the patient's thighs and calves (fig. 5–17 Ⓐ). On signal, all three lift, turning the patient in against their chests.
3. On signal, all pivot backward, with number 1 man as the axis (fig. 5–17 Ⓑ). On signal, all step forward and lower patient to the stretcher (fig. 5–17 Ⓒ).

A

B

C

Figure 5–17. Three-man arms carry, bed to stretcher.

EARLY AMBULATION

Ambulating (walking) a patient as early in the course of his medical or surgical treatment as possible is an important part of present-day patient care. The primary purpose of early ambulation is to prevent complication of prolonged bed rest—complications such as circulatory disturbances in the legs, lung congestion, constipation, or urinary retention. It is essential to remember that although early ambulation helps a patient to recuperate and become self-sufficient, he continues to need a great deal of nursing care and nursing support while he gradually progresses through successive stages of rest and activity. The medical specialist must know how to assist a patient out of bed to an erect position while he is weak, has pain, and is justifiably apprehensive. Once out of bed, the patient walks, from a step or two to a longer distance, before returning to bed.

Conditioning Exercise Programs

1. Conditioning exercises are planned series of exercises to maintain muscle tone and strength for patients who are incapacitated by sickness and injury. They are prescribed by the doctor. In Army Medical Department facilities, the physical therapy section is consulted, and a qualified physical therapist evaluates the individual patient and plans and conducts a programmed series of exercises.

2. In general, prescribed exercises keep the principal muscle groups of the back, abdomen, and upper and lower extremities from becoming "deconditioned." Exercises for bed patients are conducted on the ward, either on an individual basis or as group instruction for selected patients.

3. Many of the programs require on-the-hour (or other interval) self-administered exercise by the individual patient as essential followup of an exercise period which has been supervised by a physical therapist. The success of the program requires understanding and wholehearted support of nursing personnel, but it is not appropriate to include instructions for administering specific exercises in this manual. The medical officer arranges for conferences and instruction of nursing personnel. Examples of exercises requiring on-the-hour followup are quadriceps setting to strengthen thigh muscles for walking and range-of-motion exercises for weakened or paralyzed arms

and legs. Planned and supervised exercises help restore the patient to his maximum capacity to carry on the activities of daily living.

Section IV. PATIENT HYGIENE AND COMFORT

5-21. Oral Hygiene

Oral hygiene (mouth care for cleanliness) is essential to the care of all patients, as the mouth normally harbors many bacteria. The patient's resistance may become so lowered during illness that severe infections of the mouth tissue may result. Mouth breathing, restricted oral fluids, elevated temperature, and other conditions that accompany illness cause drying and cracking of mouth tissues. Such conditions aid the development of infection. When a patient is too ill to care for his mouth or teeth, the medical specialist must help him or must perform the procedure for him. Ambulatory patients may need reminding to carry out self-care measures. Problems in oral hygiene should be referred to the Dental Service.

ROUTINE MOUTH CARE

Mouth care should be given at least every morning and evening to all patients, and preferably after every meal. Routine mouth care is essentially assisting a patient to brush his teeth and to rinse his mouth thoroughly, as often as needed. The purpose is to keep the mouth clean, to prevent sores and mouth odors, and to refresh the patient.

Equipment

Glass of water
Drinking tube p.r.n.
Hand towel
Toothbrush and dentifrice
Mouthwash, if desired

Procedure

Patient Able to Help Himself

1. Place the patient in a comfortable position.
2. Arrange equipment within his reach on bedside table or on overbed table.
3. Remove and clean equipment promptly when he is finished.

NOTE

Rinse toothbrush thoroughly under running water and allow it to air dry—do not place the damp brush in cabinet.

Patient Requiring Assistance

1. Turn patient on side or if on back, turn his head to the side.

Figure 5-18. Assisting patient.

2. Place towel under his chin and over bedding.
3. Pour water over the brush; place dentifrice on it.
4. Give the patient his brush; hold basin under his chin while he brushes his teeth (fig. 5-18).
5. Let the patient rinse his mouth frequently, using the drinking tube. Encourage him to swish the rinse water vigorously, moving his cheeks, to flush away the loosened debris.
6. Remove the basin, wiping his face and lips with the hand towel.
7. Remove and clean the equipment.
8. Wash hands.

When the Patient is Unable to Brush His Own Teeth

Proceed as in "Patient Requiring Assistance," doing all steps for the patient. To brush his teeth—

1. Start with the front teeth and brush each area about 6 times, progressing from one side of the mouth to the other.

NOTE

The surfaces of teeth next to the tongue and cheeks are the most difficult to reach and thus require the most attention.

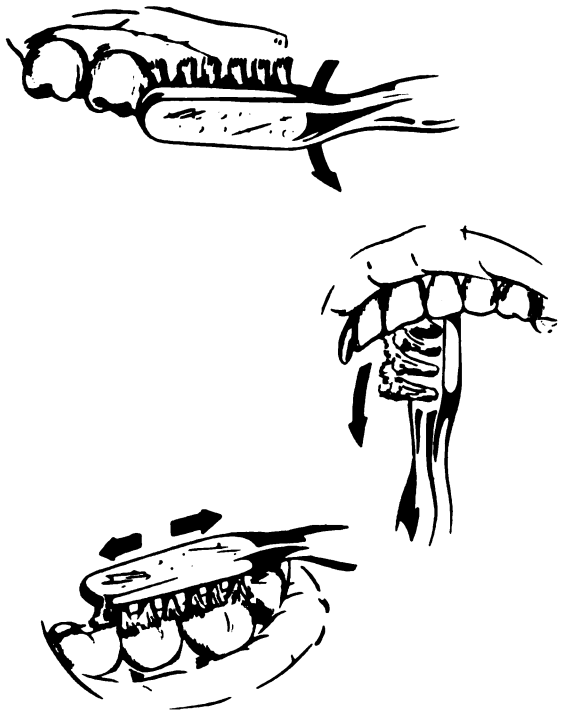


Figure 5-19. Method of brushing the teeth.

2. Brush outer and inner surfaces of the teeth from the gum margins toward the biting edges, brushing lower teeth up, upper teeth down. Use a back-and-forth scrubbing motion on the biting surfaces (fig. 5-19).
3. Finish the mouth cleansing with a gentle brushing of the tongue from back to front and with a final thorough rinsing.

CARE OF DENTURES

Give dentures the same careful cleansing as the natural teeth. The conscious patient should wear his dentures. Since many patients are sensitive about having artificial teeth, be especially considerate to spare them embarrassment. Clean dentures under running water, if possible.

NOTE

Be sure patient cleans his mouth and any natural teeth while dentures are out of his mouth.

Equipment

Tissues
Washbasin
Toothbrush (or denture brush)
Dentifrice
Denture container

Procedure

1. Have patient remove his teeth and place them in the denture container. This may be a glass of water if a special container is not available.
2. While the patient cleans his mouth, take his denture to the sink. Give him tissues to wipe his mouth.
3. Place the basin in the sink. Brush the denture over the basin, under running water. (The basin containing water will cushion the denture if dropped.) Rinse denture.
4. Place the denture in a basin of water while cleaning denture container. Return dentures in container to patient.
5. When not in use, store dentures in a clearly marked, clean container, filled with clean water. Do not allow patient to wrap denture in tissue or handkerchief and store it in his pajama pocket, under his pillow, or in the drawer.

5-22. Special Mouth Care

Special mouth care is care required for oral hygiene that cannot be accomplished by routine tooth brushing and mouth rinsing measures. Patients with mouth injuries, oral surgery, or inflamed mouth tissues because of systemic illness or other causes are given mouth care in accordance with medical or dental orders. However, many patients, because of this general condition, require special mouth care as part of their basic nursing care; any seriously ill, unconscious, or otherwise incapacitated patient must have his mouth kept clean, moist, odor free, and refreshed. By carrying out nursing measures at regular, frequent intervals—every 1 or 2 hours, or more frequently when required—the first signs of inflammation can be detected early and reported at once to the doctor for treatment. Unless otherwise ordered, equipment and procedure for special mouth care are as follows:

EQUIPMENT

Flashlight
Cotton-tipped applicators, q.s.
Tongue blade
Glass of water
Drinking tube
Paper cup
Asepto syringe with rubber tip
Emesis basin
Hand towel
Lubricant (petrolatum ointment or liquid)
Paper bag for waste

NOTE 1

Add suction machine for the patient who is unconscious or otherwise in danger of aspirating solution.

NOTE 2

For some patients, a small (child-size) soft-bristled toothbrush may be used, alone or in combination with applicators.

PROCEDURE

1. Assemble equipment on a tray to be kept at the bedside.
2. Place patient on his side.
3. Place towel under his chin and over bedding.
4. Using tongue blade and flashlight, gently examine interior of mouth to detect any sore or bleeding areas before starting cleansing. Report these conditions immediately, in order to obtain any special instructions.
5. Pour water and mouthwash, half and half, into paper cup.
6. Moisten applicator in mouthwash solution.
7. Using tongue blade to hold mouth open and to move lips and cheeks gently away from tooth surfaces, use moistened applicator to cleanse teeth and mouth tissues, as with a toothbrush. Use fresh applicator for each section of mouth —do not redip one into clean solution. Discard after each use.
8. If possible, have patient use drinking tube to rinse mouth, first with mouthwash solution, then with fresh water.
9. If patient is unable to use drinking tube, gently irrigate mouth with asepto syringe. Use small amount of solution at one time, directing stream from rubber-tipped syringe to side of mouth to prevent choking.

NOTE

If patient is unconscious or otherwise in danger of aspirating solution, maintain suction with suction catheter at the same time solution is introduced with syringe. An assistant may be needed for this phase of mouth care.

10. Cleanse tongue, using tongue blade and applicator.
11. When cleansing and rinsing process is finished, remove basin, gently drying face and lips with towel.
12. Apply lubricant thoroughly but sparingly to lips, using clean applicator.
13. Make patient comfortable.
14. Remove soiled equipment. Clean and reset tray.
15. Wash hands.

5–23. Urinal and Bedpan Assistance

Most bed patients find using the urinal or bedpan a necessary but sometimes embarrassing experience. It is a nursing responsibility to reduce the unpleasant aspects as much as possible and to assist the patient to maintain proper elimination with the least exertion. The urinal or bedpan is provided promptly whenever requested. In addition, all bed patients are usually offered one before meal hours and visiting hours. Both patients and personnel must wash their hands after use.

PROCEDURE

Use of the Urinal (Male Patient)

1. Bring urinal, inserted in paper cover, to the patient. Screen the patient and give the urinal directly to him, placing the cover on the seat of the chair.
2. Assist the patient as needed; *for example,* adjustment of pajama trousers or placement of urinal. Be sure to place the urinal in level position after lowering the knee gatch p.r.n. Instruct the patient to signal when finished. Be sure he understands that he must never place the urinal on his bedside stand.
3. On signal, return promptly, bringing a basin of warm water. Remove the urinal from the bed. Assist the patient to wash his hands.
4. Note the color and amount of urine before discarding it. If output record is kept, measure and record the amount and time voided on DD Form 792, Intake and Output Worksheet (I & O). If the appearance of the urine seems abnormal, save a specimen for the doctor to observe.
5. Follow routine procedure for cleansing and storing the urinal.

Use of the Bedpan
(Male or Female Patient)

1. Bring warmed bedpan, inserted in paper cover, to the patient. (To warm the bedpan, rinse with hot water, then dry.)
2. Screen the patient.

3. Place the covered pan on the chair seat and prepare to assist the patient p.r.n. Lift bed covers, remove any supporting pillows, and lower the knee gatch. Pull pajama jacket above waist and pants to below knees. Tell the patient to bend his knees, press heels against the bed, and raise his hips. Slip one hand under his back, and place the pan under his buttocks. (If the patient is heavy and unable to assist in lifting, ask for assistance. If he cannot raise his buttocks, roll him to the near side of the bed, place the pan against his buttocks, and then roll him back on the pan.) Check his position on the pan.
4. Elevate the head of the bed. Place toilet paper and signal cord within his reach. Leave patient alone unless he requires constant attention.
5. When patient is through, answer signal promptly, bringing a basin of warm water. When removing the pan, support the patient in the same way as in placing it. If the patient is unable to cleanse himself, turn him on his side off the pan and cleanse him with paper. If necessary, wash the anal area with soap and warm water; dry thoroughly.
6. Place covered pan on chair. Readjust pajamas, bedding, and patient's position. Remove the screen. Air the area by opening a window, if possible.
7. Before disposing of contents of the bedpan, look at them, noting amount, consistency, color, and unusual appearance. If in doubt of appearance, save a specimen for the doctor to observe. Record the stool on the I & O Worksheet, if used; otherwise, record it in the defecation or bowel movement (BM) column on the TPR worksheet.
8. Follow routine procedure for cleaning and storing the bedpan.

5–24. A.M. and P.M. Care

A.M. (morning care) and P.M. (evening) care are hygiene and comfort measures provided for all bed patients on a systematic, routine basis. A.M. care prepares the patient for breakfast; P.M. care prepares the patient for the night. This care is usually provided for a group of patients who require varying degrees of assistance, and the specialist must organize all activities; *for example,* he will use a wheeled cart to transport equipment and will distribute equipment first to patients who are able to help themselves and then to patients who require help.

A.M. CARE

This is usually started about 1 hour before breakfast or at the time scheduled for "lights on." The patient is given the opportunity to void, to wash his face and hands, to brush his teeth, and to be generally refreshed and ready for breakfast.

Equipment

For Cart

Large pitcher with hot water
Large pitcher with cold water
Stock bottle of mouthwash
Bucket
Large paper bag for trash
Paper towels

For Each Patient

Face basin
Paper cup
Emesis basin

Procedure

1. Offer urinal or bedpan as needed.
2. Collect urinal or bedpan.
3. Wash hands.
4. Load cart with equipment listed above.
5. Distribute to each patient a wash basin half full of warm water, a paper cup half full of mouthwash, and an emesis basin. Place the patient's personal articles within his reach—toothbrush, dentifrice, towel, washcloth, soap, glass of water, and comb.
6. Assist each patient as needed in washing face and hands and brushing teeth.
7. Change wet or soiled linen; straighten top bedding.
8. Leave each patient in correct position for receiving breakfast tray—head of bed elevated, or patient on his side. Clear table top and place it in position for the tray.
9. Remove used and any unnecessary equipment from the unit. Pour waste water in bucket and discard used paper cups in trash bag. Wipe up any spills on the patient's table or on the floor, using a clean paper towel each time.
10. Take cart to utility room. Clean all equipment according to routine procedure. Discard trash. Clean cart and return it to designated storage area.

P.M. CARE

This care is usually started after evening visiting hours or about 1 hour before the scheduled "lights out."

Equipment

Same as for A.M. care, plus rubbing alcohol or lotion compound.

Procedure

1. Follow A.M. care procedure.
2. Add back rub for all bed patients and for newly ambulatory patients who may have completed their evening toilet in the bathroom.
3. Tighten and straighten foundation and top bedding. Turn and freshen pillows.
4. Place bedside table and signal cord within patient's reach. Give fresh drinking water if it is permitted. Provide extra blanket if needed.

P.R.N. CARE

P.r.n. care refers to the hygiene and comfort measures provided whenever needed, day or night, for an individual patient. Such care may include any or all of the following: special mouth care; a complete or partial bath; back rub; changing position; changing or straightening bed linen; and providing additional pillow supports or other comfort devices.

5-25. The Cleansing Bath

a. General. The bath stimulates circulation in the skin and underlying tissues and promotes health and comfort. Bath procedures also provide excellent opportunities for observation of a patient's physical and emotional condition, for patient-centered conversation to promote good interpersonal relationships, and for patient teaching.

b. Instructions. The cleansing bath may be a complete bed bath, a partial bed bath, a tub bath, or a shower. The choice is determined by the patient's condition, the approval of the doctor or nurse, and the facilities available. All four types represent different stages of progress in the activities of daily living. In all cases, the specialist is responsible for the preparation, assistance to the patient as necessary, and clean-up of the bath area.

(1) The convalescing ambulatory patient may still require active assistance in the tub or shower. If so, the specialist stays with the patient and assists as necessary. He should personally observe and note which body area, if any, the patient is unable to bathe properly and must then complete the bath for the patient. If it is not necessary that he remain with the patient, he must still check on the patient at intervals.

(2) For safety, the door to the bath or shower area must not be locked when occupied by a patient. A tap bell or other nonelectric signal device should be within the patient's reach.

5-26. The Cleansing Bed Bath

A bath in bed cleanses, comforts, and provides circulatory stimulation and controlled exercises for the patient confined to bed. When the patient must conserve energy or is helpless, the specialist gives the entire bath. When some degree of self-care is permitted, the specialist supplies all necessary equipment and bathes the areas the patient cannot reach. He also bathes and rubs the back of all self-care bed patients.

a. Overall body cleanliness is important, but there are occasions when a complete bed bath would be exhausting. Then a partial cleansing bath is given, to include face, hands, axillae, genitalia, back, and buttocks.

b. If limited patient participation is permissible, the specialist assists the patient in brushing his teeth, in washing his face and hands, and in any other way needed. While assisting, he observes the patient closely and takes over before fatigue sets in.

c. The patient's position during the bath is determined by his physical condition and the movement permissible. Unless contraindicated, the bed is flat, and movement and position change is encouraged. The specialist is expected to use good body mechanics and to request assistance when necessary in moving and positioning the patient.

d. When supporting binders and leg bandages are used, the specialist finds out in advance if they can be removed for skin cleansing and if they are to be reapplied. The patient receiving a bed bath will often have tubing attachments that must be handled so that they continue to function as he is moved and turned. All tubing must be carefully checked before and immediately after position changes.

EQUIPMENT

Wash basin
Warm water (110–115 degrees F)
Skin lotion
Pajamas

Sheets, 2
Pillowcase, 1
Portable screen p.r.n.
Laundry hamper

NOTE

Patient should have the following articles in his bedside table:

Soap
Soap dish
Deodorant
Nail file
Comb
Bath towel
Hand towel
Washcloth

PROCEDURE

1. Visit patient and inform him of procedure. Offer bedpan or urinal.
2. Check for required personal toilet articles and clean linen available in unit. Clear top of bedside cabinet and place cabinet and chair for optimum workspace. Check for drafts. Position screen as required for privacy.
3. Take bath equipment to unit and place on cabinet. Place clean linen, in order of use, on chair.
4. Loosen top covers at foot of bed. Fold and remove spread and blanket. Leave top sheet for cover.
5. Lower gatch to level position, if permissible.
6. Remove pillow. Place at back of chair. (Hang pillowcase to receive soiled linen, if laundry hamper is not readily available.)
7. Move patient to near side of bed.
8. Remove pajamas. If the patient has an injured arm or shoulder, start removal from the uninjured side. (When movement must be minimal, the coat is worn back to front and left unfastened.)
   a. *To remove the coat.* Unbutton and tuck excess material under the back toward the far shoulder. Raise far shoulder, remove sleeve, and tuck coat under to near shoulder. Raise near shoulder and pull coat through, removing it from near arm.
   b. *To remove the pants.* Loosen waist tie, unbutton, and pull below the hips while keeping the patient covered with the sheet. Grasping the waist portion, ease pants off over the feet.
9. Place bath towel under the patient's head and hand towel over the chest.

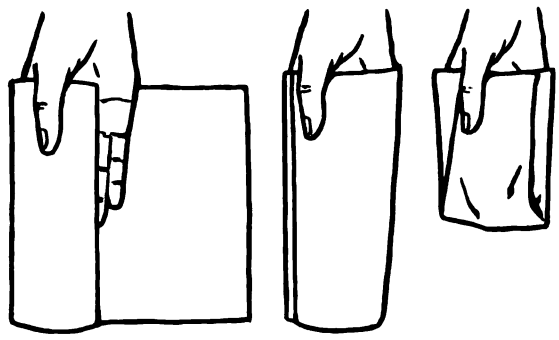


Figure 5-20. Mitten washcloth.

10. Secure ends of washcloth in the hand to avoid dangling corners. It may be used mitten fashion (fig. 5-20). It should be wet but not dripping.
11. Bathe the eyelids, using a different portion of the cloth for each eye.
12. Apply soap to cloth, unless no soap is used on face. (Do not leave soap in wash water.) Using firm, gentle strokes, wash face to hairline, then wash ears and neck. Rinse and dry with hand towel.
13. Remove bath towel from under patient's head. Expose far arm. Place bath towel lengthwise under shoulder and arm.
14. Wash arm, using long firm strokes from wrist to shoulder. Wash armpit thoroughly. Rinse and dry. Apply deodorant, if used by patient.
15. Fold towel in half. Place basin on folded towel on bed; immerse patient's hand in water. Wash hands and nails, encouraging finger movement. Trim and clean fingernails if needed.
16. Remove basin and dry the hand.
17. Repeat procedure on near arm and hand.
18. Wash chest and abdomen.
    a. *Male Patient.* Turn sheet back to waist. Place bath towel at edge of sheet. Wash, rinse, and dry chest.
    b. *Female Patient.* Place hand towel over chest to avoid undue exposure of the breast and turn sheet back to waist. Lift corner of the towel while bathing patient to observe skin. Support pendulous breast and observe and wash skin fold areas. Dry gently but thoroughly.
19. Cover chest with hand towel. Turn sheet back to pubic hair line. Wash, rinse, and dry the

Figure 5–21. Method of draping sheet for bathing lower extremity.

abdomen, umbilicus, and hips. Cover chest and abdomen with sheet. Change bath water p.r.n.

20. Expose the far leg, draping sheet securely into the groin and under the thigh. Check to see that genitalia are not exposed when the leg is flexed (fig. 5–21).
21. Wash, rinse, and dry the thigh and leg.
22. Place basin on a towel on the bed so that the patient's foot can be immersed in the basin, with no pressure on calf of leg. Wash foot, paying particular attention to the skin between the toes, at the heels, and at the ankles. Encourage toe and ankle movement. Clean and trim toenails if necessary.
23. Support leg at knee and heel when removing foot from basin. Place basin on table. Dry the foot thoroughly, rubbing any calloused area with towel to remove dead skin. Apply lotion to foot and ankle, massaging heel in circular motion with palm of hand.
24. Repeat procedure on near thigh, leg, and foot.
25. Change the bath water. Rinse washcloth thoroughly.
26. Turn patient to wash back and buttocks. His position may be prone (on the abdomen) or lateral recumbent (on the side) but the entire back and buttocks should be exposed.
27. Place towel close to the back and lengthwise on the bed.
28. Bathe, rinse, and dry the back from neck to sacrum. Pay particular attention to folds of buttocks and anal area.
29. Rub back with lotion. Use firm, gentle, circular movements, starting at base of the spine and rubbing with heel of both hands, up and out, over the shoulders. Finish with circular movements at cervical spine and nape of the neck.
30. Turn patient on his back, to near side of the bed, and place towel under hips.
31. Hand patient the prepared washcloth and assist in washing the pubic area and genitalia as necessary. There should be minimal exposure but thorough washing, rinsing, and drying.

NOTE

If the patient has an indwelling catheter, the entire procedure is done by the specialist.

32. Put pajamas on the patient.
    a. *To replace the coat.* If the patient has an injured arm or shoulder, start replacement from the injured side. Slip hand through sleeve cuff to shoulder, and grasp patient's far hand. Draw hand and arm through sleeve. Raise far shoulder and tuck material under to near shoulder. Guide near arm through sleeve.
    b. *To replace the pants.* Slip hand through pants leg from the cuff to waist, and grasp patient's feet to guide each leg through its pant leg. Raise patient's buttocks and pull over hips to the waist. Fasten buttons and waist tie.
33. Comb patient's hair.
34. Remove bath equipment to utility room. Clean and store it as prescribed.
35. Remake the bed. If permissible, assist the patient from the bed to chair or stretcher and make bed as in paragraph 5–13. If patient must remain in bed, remake the occupied bed as in paragraph 5–14.

5–27. Care of the Patient's Hair

Daily care of a patient's hair is needed for morale; to stimulate circulation of the scalp; and to prevent tangled, matted hair.

a. Daily Care. Encourage the patient to rub his scalp with fingertips to stimulate circulation. Comb in becoming style. To assist a woman patient to comb matted and tangled hair, first comb

the ends and progress toward the scalp. Hold the lock of hair being combed between the scalp and the comb to avoid pulling.

b. Hair Cutting. Barber service is provided in most service hospitals. The barber makes regular rounds on the ward or comes by appointment. The patient receiving the service pays the fee directly to the barber. Occasionally hairdresser service can be arranged for women patients on the ward. Ambulatory patients go to the barber shop or beauty parlor, if the ward officer approves.

SHAMPOO

The patient confined to bed will require a cleansing shampoo at least every 2 weeks. With the approval of the ward officer, plan the shampoo for a time when the patient feels rested and has no conflicting treatments or appointments. If the patient can be moved to a stretcher, do so and take him to a convenient sink. If this is not possible, do the shampoo in bed.

Equipment

Large pitcher of warm water
Bucket
Newspaper
Large rubber sheet
3 bath towels
Washcloth
Shampoo solution
Clean comb and brush

Procedure

1. Place newspaper on chair and bucket on the newspaper. Place pitcher of water, shampoo, comb, brush, and two of the bath towels on table.
2. Move patient to near side of bed. Lower bed to level position.
3. Pull pillow down under the patient's shoulders to hyperextend the neck. Fold one bath towel around neck.
4. Place narrow side of rubber sheet under head and over edge of pillow. Roll sides of sheet to improvise a trough, and place free end in bucket.
5. Give the patient a washcloth for eyes and face.
6. Check provisions for water drainage before pouring any water.
7. Wet hair and apply shampoo. Lather. Rinse.
8. Reapply shampoo, rinse again repeatedly until hair is "squeaky clean." (A woman will require more rinse water than a man, but otherwise the procedure is unchanged.)
9. Slip a dry towel under patient's head while rolling and removing rubber sheet. Pull pillow up into place.
10. Dry the hair by gently rubbing with a clean towel.
11. Remove equipment. Wipe up any water spilled on floor.
12. Assist the patient to comb and brush clean hair with clean comb and brush.

5–28. Position Support Devices

a. Position Support Devices. These devices are aids used for maintaining good body alinement and comfort for patients confined to bed. Support devices in common use on a hospital ward include the bed gatch; footboards; pillows; sandbags; and rolled and folded towels, sheets, and blankets (fig. 5–7). Any device used should meet the following requirements:

(1) Promote correct posture.

(2) Conform to the part of the body being supported.

(3) Be firm enough to support, yet not cause pressure.

(4) Be large enough to support a part along its entire length.

(5) Be clean and protected when necessary from moisture and body secretions.

b. Use of Support Devices. Explain to the patient the reason for using a device and encourage his participation in maintaining good body alinement. Any device used should serve a purpose. When a variety is needed for an individual patient, all of them may not be required at any one time, so an extra chair or table at the bedside may be needed for storage, particularly of pillows. Superfluous equipment should be removed.

(1) *The bed gatch.* Raising and lowering the back and knee rests on an adjustable bed provides support and allows for position changes, but there are disadvantages that must be considered. When the back rest is elevated, the patient tends to slide down in bed, with his body weight concentrated on the base of his spine, which is undesirable. Elevation of the knee rest counteracts this to some extent, but continued use of the knee rest causes undesirable pressure in the popliteal space, and can lead to flexion contracture of the knee and hip. The bed gatch should therefore be used for variations in position and not as a substitute for active movement of the patient.

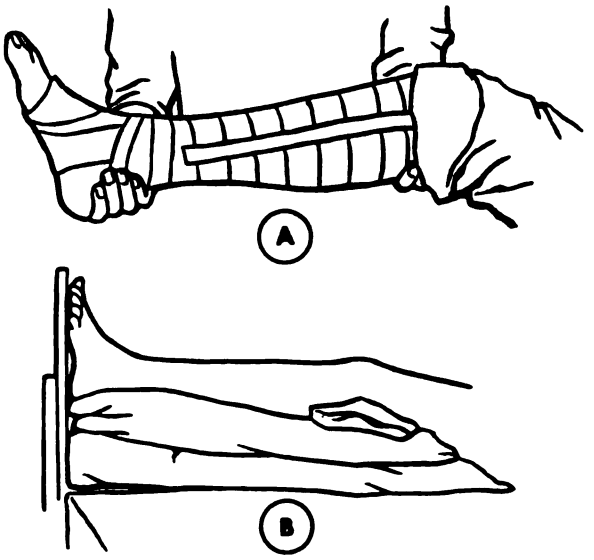


Figure 5-22. Positioning an injured arm or leg.

(2) *The footboard.* When properly placed in relation to the patient's feet, the footboard helps prevent foot drop (plantar flexion). The patient's feet should be supported at right angles to the legs when he lies on his back. A padded board, a firm pillow, or a blanket roll is braced between the end of the bed and the patient's feet. Such a device also helps prevent sliding down in the bed, relieves the pressure of bedding on the toes, and provides a resistant surface against which the patient can push for exercise to maintain circulation and muscle tone. The board or pillow roll should extend higher than the toes.

(3) *Pillows.* These have multiple uses, but placement in relation to body curves is essential. The standard-size pillow is often too large, but folded bath towels placed in a pillowcase can be substituted when small, firm pillow support is recommended. When the patient is supine or has the back rest elevated, the pillow supporting the head should start well under the shoulders. (A common mistake is to tuck the pillow behind the neck, forcing the head forward.) When pillows are used to elevate an extremity, they should be placed so that the entire limb is supported. Two or more pillows may be required. It is important to remember that, unless otherwise ordered, the foot or hand should be slightly higher than the rest of the extremity. Arrange the pillows in order to provide an inclined plane. In moving an injured arm or leg, place both hands beneath the injured limb, at the joints above and below injury (fig. 5-22 Ⓐ). Raise the limb slowly and gently and place it on the supporting pillow or pillows (fig. 5-22 Ⓑ).

(4) *Sandbags and bolsters.* Sandbags, firmly rolled bath towels, or folder sheets are used to support joints in anatomical position. *For example,* when the foot is supported against the footboard, the ankle joint may need support on either side to prevent inversion (sole of foot turned inward) or eversion (sole of foot turned outward). A trochanter roll helps to prevent external rotation of the thigh and hip joint when the patient lies on his back. To make a trochanter roll, fold a sheet so that it is just wide enough to extend from the iliac crest to the midthigh. Then anchor and roll the sheet as follows: Place one end smoothly under the buttocks; then roll the free end in "underneath" fashion until the roll is well under the patient's buttock.

5-29. Bed Cradle

A bed cradle (fig. 5-23) is used to relieve a part of the body from the weight of bed covering. Extremities may be elevated on pillows, and the cradle dimensions are designed to accommodate this. Bed making is modified for protection, comfort, and neat appearance.

EQUIPMENT

Bed cradle, standard model or field (collapsible)
Roller bandage
Unit bed linen, plus 1 additional sheet and blanket

PROCEDURE

1. Complete bed foundation as for the occupied bed.
2. Place cradle in position over the patient, with no part in contact with a body part. Secure cradle in place with bandage loops tied to the bedframe.
3. Place top covers to provide adequate covering for the shoulders, draping these ends over the head-end of cradle.
4. Place additional blanket and covering sheet crosswise over cradle, overlapping the top covers, with surplus toward the foot of the bed.
5. Tuck the surplus edges of cradle covering under the foot of the mattress. Miter corners, arranging top folds to hang free. Fold back the overlapped covers as required for access to the body part protected by the cradle.

Figure 5–23. Bed cradle.

5–30. Prevention of Pressure Sores

a. General. A pressure or bed sore is a break in the skin caused by unrelieved pressure on the skin surface. The body areas on which pressure sores are most likely to develop are over bony prominences (fig. 5–24). (Although not illustrated in figure 5–24, bedsores can also develop on such areas as toes, knees, shoulders, chin, and forehead.) In these areas, circulation to the skin is easily restricted by the pressure of body weight, and any patient unable to move and change position is susceptible. Pressure sores develop in recognized stages. In the first stage, there is redness of the skin area; in the second, a bluish or mottled discoloration of the skin; in the third, a break in the skin which can rapidly develop into a decubitus ulceration (a destruction of underlying tissue). Pressure sores can develop within a few hours of neglect and complicate recovery for weeks and months. They can, however, be prevented by good nursing care.

b. Preventive Nursing Measures.

(1) Change the patient's position at least every two hours, or more frequently if necessary. Remember that there are four body surfaces on which to turn the patient to relieve pressure on any one area.

(2) Inspect all skin areas of all bed patients daily during the bath procedure and at evening care. Massage skin areas over bony prominences to stimulate circulation. Report any suspicious (reddened) area immediately to the nurse in charge, and relieve pressure by changing position. Report any complaint of numbness or tingling under a cast or splint.

(3) Keep the patient's skin clean and dry. Wash areas soiled by body excretions immediately with soap and water, rinse well, and dry thoroughly.

(4) Keep bed linen clean, dry, free of wrinkles, and free of crumbs and any other foreign matter.

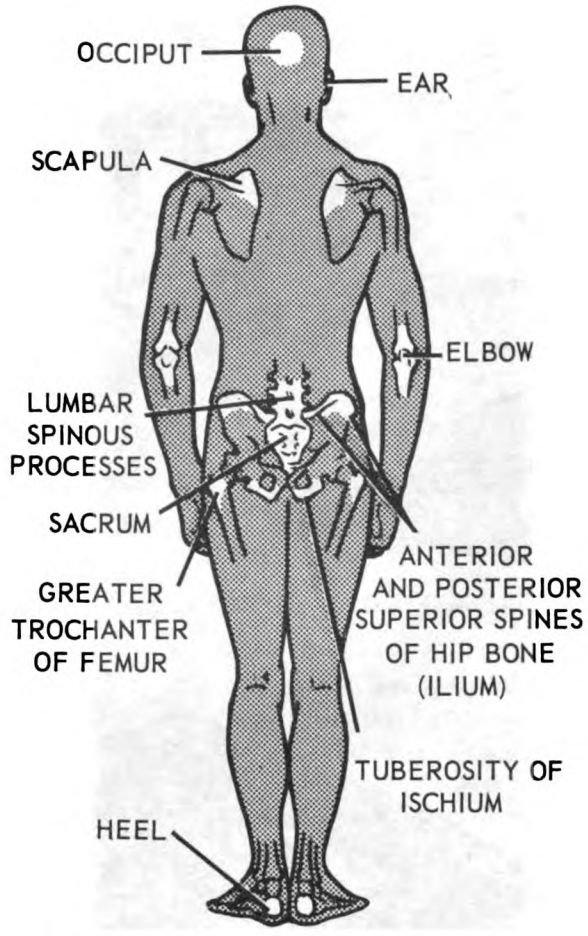


Figure 5-24. Areas susceptible to bedsores.

(5) Use pillows and all positioning and comfort devices properly. Rubber rings, cotton doughnuts, and similar articles often cause new circumscribed pressure areas and are thus not considered advisable.

c. Treatment of Pressure Sores. The best treatment is prevention by proper nursing care. Medical officer's orders must be followed for application of any medication. Aseptic technique must be used on any broken skin areas.

d. Use of Alternating-Pressure Mattress. This mattress is a device to provide continuous redistribution of pressure points for a patient confined to bed. It is a vinyl plastic pad with air cells running the length of the pad. The air cells are alternately inflated and deflated by an air pump motor unit which provides automatic control. It is not a substitute for preventive nursing care, but it is a supplement to this care. The mattress, a nonstandard item obtained through a special purchase order, is used in many Army Medical Department hospitals. It is usually stored in the ward unit for which it has been ordered.

Procedure

1. Set up and check out the mattress on a bed to which the patient will be transferred.
2. Place the alternating pressure pad on top of the regular mattress with the inlet air tubes at the foot of the bed. Tuck the apron ends under the bed mattress. Attach tubing to the pump unit and connect pump to electrical outlet.
3. Locate and turn on the air pump switch. The change of air in the cells will be barely perceptible to the hand; it is a continuous, slow, rippling motion. Check for leaks by running fingertips slowly over the surface. Make sure tubing is not kinked or pinched.
4. Make the bed in the usual fashion, omitting a rubber or plastic drawsheet.
5. Avoid puncturing an air cell with the pins used to secure drainage tubing or signal cord to the foundation bed sheet.
6. Following use, or when soiled during use, wash with soap and water or detergent-germicide solution. Dry thoroughly.

NOTE

The vinyl will not be damaged by alcohol or other germicides, but it cannot be autoclaved.

5-31. Protective (Restraining) Devices

a. Purpose. Protective devices are mechanical restraints used to protect a patient from self-injury. Devices commonly used include side rails, folded sheets, hand mitts, and wrist or ankle ties.

b. General Instructions.

(1) Use protective devices for patient safety but never as a substitute for nursing vigilance. A patient needing a protective mechanical restraint must have extra-vigilant nursing care.

(2) Obtain a medical order for the use of a protective restraint. It is a nursing responsibility to protect a confused, irrational, unconscious, or drug-sedated patient. The medical order is often a p.r.n. order, and the physician thus relies on nursing judgment for its use.

(3) Tell the patient gently and repeatedly, why the device is being used, whether the patient seems able to respond or not. Assure him that someone will always be near to help and care for him. Remember that the normal reaction of a confused patient is to resist restriction of movement.

(4) Release any restraint and change the patient's position at definite time intervals, at least every 2 hours, day and night.

(5) Apply and use any such device so as to prevent injury. *For example,* side rails must be mechanically in good operational condition and devices applied to any part of the body must not impair or restrict circulation, cause pressure on skin surfaces, or contribute to faulty body alinement.

c. Use of Side Rails. Side rails are metal bar rails which help keep a patient from falling out of bed. They are the most commonly used protective device on a ward or in an emergency clinic area. Standard rails used in Army Medical Department facilities may be permanently attached to special beds used in some clinical areas (*for example,* in the recovery ward) or may be detachable and obtained from a central storage area p.r.n. Precautions for the use of side rails are:

(1) Be sure the rails are in good working order. They should be securely attached, should slide readily up or down, and should be properly latched when in the up position. Know how to secure and release the latches. Avoid pinching fingers in spring attachments.

(2) Use the rails as a pair. A common, but unsafe, practice is to push the bed against a wall and raise a side rail only on the open side of the bed. Patients can and do roll off the wall side.

(3) Be aware of the possibility that a confused patient may crawl over the side rail or over the head or foot of a bed. This possibility is not a justification for omitting the use of side rails, but it does show the need for extra vigilance.

(4) Pad rails with pillows or folded blankets when used to protect restless, hyperactive patients.

(5) Check to make sure the patient's hands, feet, and drainage or IV tubing are not caught before raising or lowering a bed rail.

d. Use of Sheet Protectors. Adequate protection may sometimes be provided by tucking top bedding well under at the sides of the bed. This serves more as a protective reminder to restrict body movement than as a restraint. When more restriction of body movement is needed, sheets may be folded lengthwise in quarters; placed crosswise over the patient's knees, abdomen, and chest; and the free ends of the sheet restraint secured by rolling over the side rail of the bed frame—not by tucking under the mattress. When sheets are used in this manner, care must be used not to interfere with respiration.

e. Use of Hand Mitts. Hand mitts (fig. 5–25) are padded hand protectors applied in boxing-glove fashion to prevent an irrational patient from pulling out drainage tubes, IV needles, urinary catheters, and other therapeutic attachments. The restless, confused patient tolerates mitts better than wrist restraints because arm movements are not restricted.

(1) Padding is applied to clean, dry skin surfaces only. All skin surfaces are separated, and the hand is placed in a position of function before final padding and wrapping. Figure 5–25 (Ⓐ through Ⓒ) shows how to position the thumb over a resilient bandage roll and how to position the fingers. Figure 5–25 (Ⓓ through Ⓕ) shows how to complete the mitt.

(2) At least every 24 hours, each mitt is removed and each hand is washed, dried, and closely inspected for any skin abrasion. The usual time for this is during the cleansing bath procedure, caring for one hand at a time.

f. Use of Wrist or Ankle Ties. The clove hitch tie (fig. 5–26) is used where a wrist or ankle restraint must be applied to restrict random movements. The advantage of the clove hitch is that the loops can be readjusted snuggly over protective padding, but they do not tighten further when the free ends are attached to the bed frame. The following precautions should be observed:

(1) When the clove hitch is used, allow enough slack in the tie ends to permit some movement. Apply the tie over well-padded areas.

(2) Remove the padding and tie, examine skin surfaces, massage area, and reapply p.r.n. at least every 2 hours.

(3) Fasten the ends of the clove hitch tie in a loop to permit immediate release when necessary.

(4) Fasten tie ends to permit alinement of the restricted extremity.

5–32. Nutrition and Patient Food Service

Proper nutrition is an essential part of the treatment and care of the patient. Diets are ordered for the patient by the doctor. They vary according to the patient's needs. In an Army hospital, all diets are planned and prepared by the Food Service Division. Meals are served in the dining hall for ambulatory patients and in most fixed hospitals, centralized tray service is provided for all patients receiving their meals on a ward. However, nursing service personnel need to be familiar with the types of diets given to patients; know

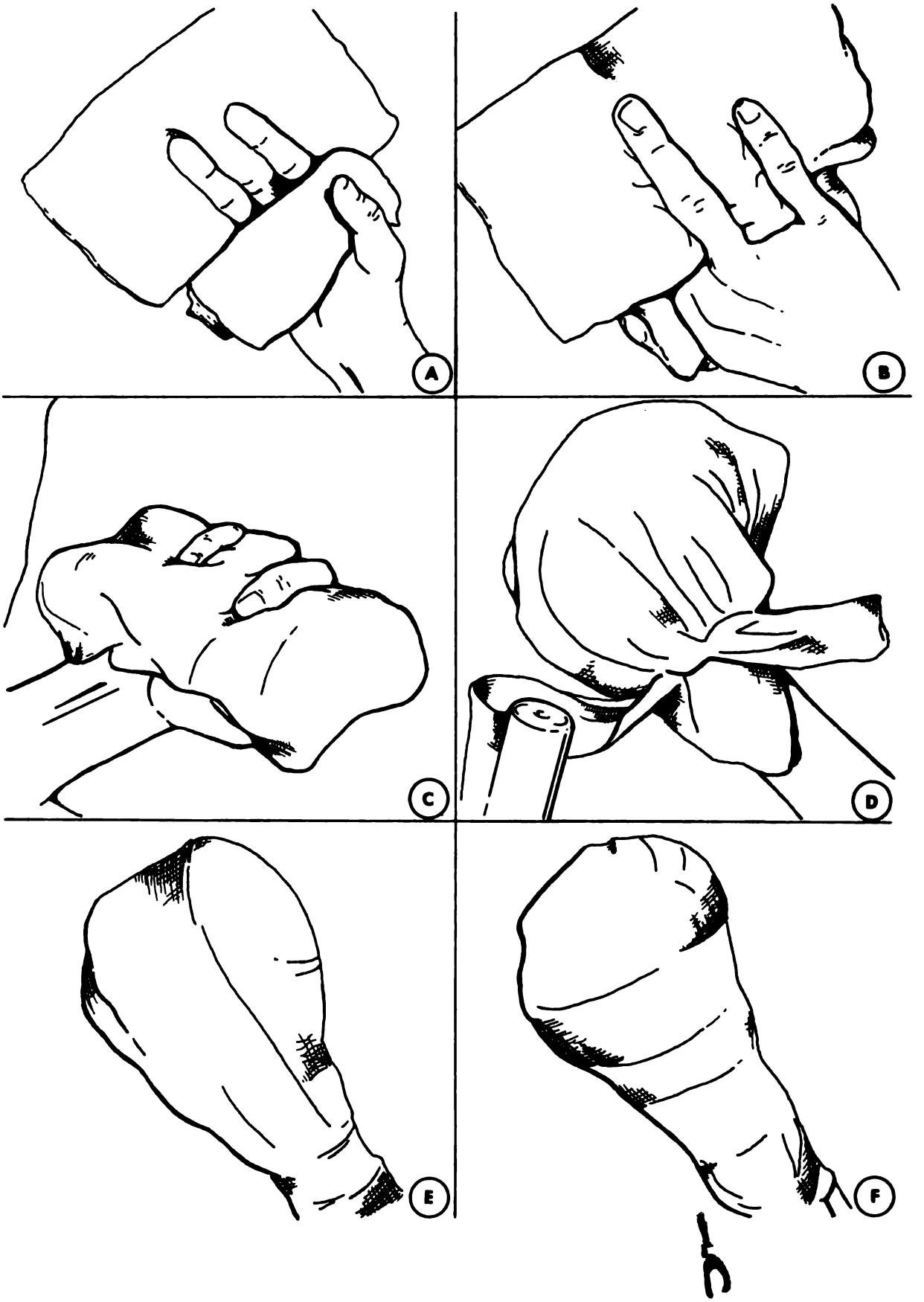


Figure 5–25. Application of mitts.

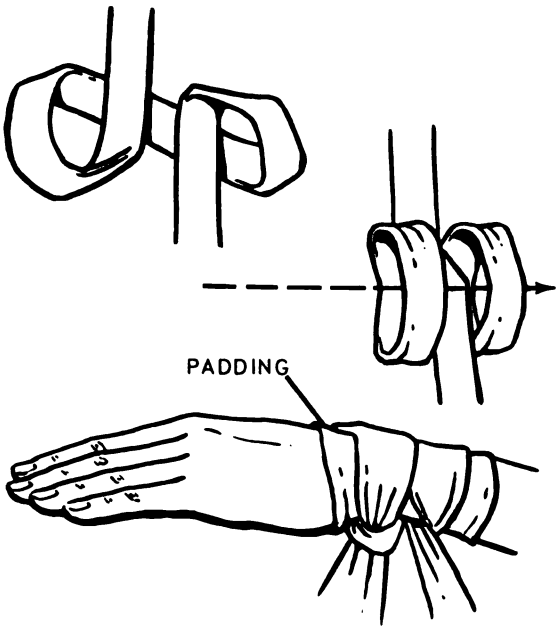


Figure 5–26. Clove hitch restraint.

how to serve the tray prepared by food service personnel; and know how to assist the patient before, during, and after mealtime. Nursing personnel also provide the environment on the ward that will stimulate the patient with a desire to eat the prescribed diet.

a. Types of Diets. The basic hospital diet is developed from four basic food groups: milk, meat, vegetable-fruit, and bread-cereal-potato-legume. Fats and sweets are then added for energy.

(1) *Regular hospital diet.* This is a high-protein, high-calorie diet. It is planned to exceed the recommended allowances for optimum nutrition of the normal individual. This is to meet increased nutrition requirements of sick or injured individuals. A patient eating all portions served would receive approximately 4000 calories daily. No supplementary, between-meal nourishments are necessary. In all fixed Army Medical Department hospitals, a selective menu form is provided by food service for patients on tray service. Nursing personnel should be aware of food choices made by the patient, as well as food consumed from the tray, and arrange immediately for consultation with a dietitian if the patient seems to need special dietary instruction.

(2) *Modified diets.* All diets modified in consistency (chopped, mashed, or strained foods) or in content (*for example,* diabetic or sodium-restricted) are ordered by name by the doctor. Modified diets, by name and content, are described in TM 8–500. Some of these diets will meet all nutrition requirements, and others will not. The one modified diet inadequate in all nutrients is the clear liquid diet. This is limited to broth, bouillon, plain gelatin, coffee, and tea, whether the meal is served as breakfast, dinner, or supper. Diets requiring supplementary between-meal feeding are planned completely by food service. The required between-meal feeding is brought to the ward ready to be served by nursing personnel.

b. Selective Menu Plan. The current trend in dietary management is to allow patients all foods that they can tolerate. A modified diet may be required only during the acute phase of disease or injury, or it may be needed for extended periods. Food service provides selective menus listing all allowable foods for each patient served on the ward. Each patient needs to understand that any item listed on his menu is allowable. Nursing personnel should check to make sure that the menu given to the patient by food service is for the diet ordered and for the right patient. If a mistake has been made, food service should be notified immediately.

c. DA Form 1829 (Ward Diet Roster). Each patient on the ward is listed on this form. An entry is made after each name indicating ward or dining hall food service, including whether the order is for regular or modified diet. The roster is collected by food service three times daily and returned to the Nursing Station three times daily. If a patient is admitted to the ward after the roster is collected, a telephone call to food service will insure that a meal is provided for the patient.

d. Ambulatory Patient Dining Hall Identification. Hours for patient's meal service are posted on the ward bulletin board. Ambulatory patients are admitted to the dining hall at these scheduled meal hours. They are identified according to local regulations. Usually the patient's identity wristband and his hospital clothing (convalescent suit) are all that is necessary.

5–33. Assisting the Patient at Mealtime

a. All Bed Patients.

(1) Offer the bedpan or urinal before tray time.

(2) Provide handwashing facilities or wash the patient's hands.

(3) Place the patient in a sitting position, unless the doctor has ordered otherwise. Clear his

table and place it in the most convenient position for eating.

(4) Avoid spilling the food while carrying the tray.

(5) Check the name on the tray card to assure that the right diet is given to the right patient. Serve the tray promptly.

(6) Remove the tray as soon as the patient has finished eating and place it on the tray cart for return to Food Service Division.

(7) Leave the patient in a comfortable position with the call bell within reach on the bedside table.

b. Semihelpless Patients. In addition to the duties in *a* above, when serving a semihelpless patient, include the following:

(1) Arrange the food and utensils within reach of the patient and place a towel and napkin to protect the bed and clothing.

(2) Prepare the food, as necessary; *for example,* cut the meat and butter the bread.

c. Helpless Patients. In addition to duties in *a* above, add the following additional assistance:

(1) Place the tray on the table in such a way that the patient can see what is on it.

(2) Provide him with a napkin and a towel bib.

(3) Stand or sit in a comfortable position for feeding the patient.

(4) Ask him to suggest the foods he desires.

(5) In giving him fluid, use a plastic drinking tube.

(6) In feeding him with a spoon, fill the spoon two-thirds full and remove the drip from the bottom by passing the spoon over the edge of the cup. Touch the lower lip with the side of the spoon, exerting slight pressure, and raise the spoon slightly to allow the liquid to flow gently into his mouth.

(7) In feeding him through a tube, keep the end below the level of the liquid to prevent his swallowing air.

(8) Allow time for chewing and swallowing.

(9) Encourage him to take all the foods and liquids on the tray.

(10) Talk with him while he eats—mealtime should be a pleasant social occasion.

c. Observing and Reporting Food and Fluid Intake. Always report to the nurse all bed patients who are not eating well or who refuse their diet. Report also all ambulatory patients who do not go to meals. If a fluid intake and output record has been ordered, keep an accurate record at the bedside.

d. Giving Water and Extra Feeding as Ordered. Drinking water is usually at the bedside of each patient so that he can drink when thirsty. Sometimes, however, the doctor will restrict the amount or will order extra fluids or food between meals or at bedtime. Check the orders carefully and help the patient to observe them. Serve all supplementary feedings provided by food service promptly, and collect food utensils for return to food service. Paper disposable dishes are often furnished for between-meal feedings.

5-34. Patient Food Service in Field Hospital Operations

In field hospital operations, the standard procedure for serving patients who receive their meals on the ward is through decentralized tray service. Food prepared by food service personnel is delivered to the ward unit in bulk containers. The food is then served by nursing personnel, using the food service set, field, a component part of the basic ward equipment. Through the mutually supportive efforts of both groups of personnel, the dietary requirement of every patient is met, even under the most arduous conditions. The specific areas of responsibility in field food service for ward patients include the following:

a. Food service personnel prepare all food according to diet orders transmitted by nursing personnel. Food in the required quantity, suitably labeled according to diet requirement, is placed in bulk serving receptacles. Under some conditions, an electrically heated food cart may be used; when this is not feasible, the food receptacles are placed in insulated containers which can be carried manually to the ward units. Local policy will determine which service division transports the food and equipment to and from the kitchen facility and the ward unit. The arrangement made for sanitizing of all food utensils, including the ward service set (compartmented plastic trays, cups, bowls, and eating and serving utensils), is the responsibility of food service under all operational conditions. The soiled utensils are sent to food service, and clean utensils are returned to the ward.

b. Nursing personnel serve the food, according to individual diet order, to patients on the ward

unit. In this situation, nursing personnel have a special responsibility to be aware of diet requirements and allowable portions.

(1) Whether or not a professional dietitian officer is assigned to a unit, the daily menus for both regular and modified diets are prepared in accordance with TM 8-500 and a hospital master menu.

(2) The food serving utensils in the ward service set are guides for portion allowances. For example, a 6-ounce ladle is used for a portion of soup, hot cereal, casserole dishes, or stews. The large serving spoon or the ice cream scoop is used for a portion of cooked vegetable, fruit, or mashed potato. However, an 8-ounce serving of a beverage such as coffee, cocoa, milk, or fruit juice is an average portion, although the plastic cup and tumbler in the food service set have a 10-ounce capacity.

(3) Dietary problems are discussed with the medical officer and food service officer or NCO. Consultation with a professional dietitian officer may be requested through military channels when none is assigned to a unit. Nursing personnel should be aware of the detailed programs in effect for meeting dietary requirements of patients in military hospitals. For example, under field conditions, special dietary foods are available under Standard "B" Ration subsistence operations even when only canned and dehydrated foods are issued. Food service personnel have professional guides for preparing several types of therapeutic diets. Commercially packaged baby foods are available, as part of the Standard "B" hospital ration, for modified diets that must be of a semisolid or fluid consistency and still meet all nutritional requirements of an adult patient.

(4) DA Form 1828 (Ward Diet Summary) is used by nursing personnel when decentralized tray service in field operations is in effect. The several modified diets most frequently required are listed. The entry column "Forced Fluids" is used to indicate the number of patients requiring oral fluids other than water for between-meal intake; beverages such as lemonade, juices, or milk drinks are provided. When the doctor orders forced fluids, the patient receives 4000 to 5000 ml. daily, and food service, if notified, will provide palatable between-meal beverages to supplement the water intake and the fluids provided at meal hours.

Section V. OBSERVATION, MEASUREMENT, AND REPORTING

5-35. Ward Nursing Procedures in Admitting, Transferring, and Discharging Patients

a. Reception of a Patient on the Ward. The manner in which a patient is received in the hospital and on his own ward is an important contributing factor to his attitude and, therefore, toward his recovery. A feeling of confidence must first of all be established. Entering a hospital sometimes stimulates a considerable amount of dread and apprehension in the patient. Admission procedure should be as brief and as reassuring as possible. Personnel should show interest in the patient as an individual and make it apparent to him that his care is planned on an individual basis.

b. Routine Admission (Ambulatory Patient). The ambulatory patient may or may not be escorted to his ward. When he reports to his assigned ward, he will usually bring with him several forms which have been initiated in the Admission and Disposition (A & D) Branch of the Registrar Division. These forms are his admission authorization. They usually include: locator cards (one of which will be placed in the card holder on the patient's bed); an identification plate for use in a mechanical imprinter; and a Clinical Record Cover Sheet (DA Form 3647). The medical specialist or the person who first greets the patient on the ward, should introduce himself and then—

(1) Check the admission forms immediately to determine the patient's name, to insure that he has arrived on the proper ward, and to determine what information is available regarding diagnosis, condition, and any required temporary treatment.

(2) Notify the nurse in charge—in the absence of a nurse, the senior medical specialist—who will then notify the medical officer of the admission. If the patient requires immediate attention, this is given before any other routine admission procedures are carried out.

(3) Check with the nurse in charge or the senior medical specialist on assignment of the patient to a bed. It is customary for one member of the nursing team to carry out certain administrative procedures such as assembling the clinical record and other paper work, while another mem-

ber carries out direct patient care procedures as outlined below.

c. Admission Procedures.

(1) Escort the patient to his assigned bed, taking along the bed locator card and placing it in the card holder on the bed.

(2) Open the bed for occupancy.

(3) If the patient has not arrived on the ward in hospital clothing issued from A&D clothing facility, issue hospital clothing (bathrobe, slippers, pajamas, and convalescent suit if needed).

(4) Follow local policy concerning admission bath or shower.

(5) Screen the unit for privacy and assist him, if necessary, to undress and to dress in hospital clothing.

(6) Follow local policy for instructing the patient to remain ambulatory or to get into bed immediately.

(7) Obtain the admission information required by the ward. A locally produced form is usually used for recording this information. It is then transcribed to the Nursing Notes (DD Form 640). Admission information includes arrival time, manner (ambulatory, wheel chair, stretcher), apparent condition, observations made on signs and symptoms, allergies, prostheses used, height, weight, TPR, blood pressure, time, name of physician notified regarding the patient's admission, and name of individual admitting patient.

(*a*) While assisting the patient to his bed, make general observations such as the patient's general appearance, condition of his skin, gait (manner of walking), any complaints of pain or discomfort, any prostheses (artificial eye, dentures, artificial limb, etc.), and any limitations in movement.

(*b*) Take TPR and BP when the patient is seated comfortably at his bedside.

(*c*) Take height and weight measurement when he is dressed in hospital clothing.

(8) Ask the patient if he has deposited in the Patient's Trust Fund any money or valuables he will not need while he is hospitalized, reminding him that he retains funds and valuables on the ward at his own risk and that he must safeguard the deposit receipt he has received from the Patient's Trust Fund representative.

(9) Orient the patient to the bedside call system. If a central speaker system is used, the patient should be shown how to use the bedside signal device.

(10) Orient the patient to the ward: introduce him to neighboring patients and show him the location of the patient's latrine and bath facilities, the patient's bulletin board, and the appointment board, if one is used.

(11) As soon as possible, have him read the ward rules and regulations. Since administrative action can be taken against patients for noncompliance with hospital and ward rules and regulations, it is vital that each patient read and understand the policies determined by the hospital commander. It is the practice in many hospitals to have the patient read and sign a statement: "I have read and understand the ward rules and regulations." This statement is then filed in his clinical record.

(12) Follow the ward policy for sending ambulatory patients to the laboratory and radiology services for routine admission specimens and X-ray. If he is to go unescorted, he must be told how to get to his destination. Whenever possible, a "You are here" diagram is used. The patient is given the appropriate clinical request forms for the examination required.

(13) Show him the ward "sign-out" roster, reminding him to sign in and to report to the nurses' station on his return from laboratory or radiology.

(14) Tell him, as soon as possible after admission, whether he will go to the dining room for meals or whether he will receive tray service. If he is to go to the dining room, he should be introduced to a patient who will accompany him for his initial meal.

d. Emergency (Direct) Ward Admissions. A patient may be admitted directly from the emergency room or outpatient clinic. Ward personnel are notified by telephone that the patient is en route by stretcher or wheel chair. Routine admission procedures are carried out after immediate medical and nursing care has been given. Upon notification of an emergency admission, the admission office sends an admitting clerk to the ward to obtain necessary information. Initial records are prepared using whatever information is available, and these records are completed or corrected later.

e. Interward Transfers.

(1) Interward transfers are initiated by the ward officer of the transferring ward after ob-

taining the consent of the ward officer of the receiving ward. When all consents have been obtained, DA Form 8–169 (Patient's Interward Transfer) is completed in duplicate. The original copy is sent to the disposition clerk in the Admission and Disposition office, and the duplicate copy is filed with the clinical record.

(2) The ward officer informs the patient, informs the head nurse, and writes an order for transfer on the Doctor's Orders (DD Form 728).

(3) A member of the nursing team not involved in assembling the records must accomplish the following:

(*a*) Assist the patient in assembling his belongings, checking to see that the patient has his property and deposit receipts in his possession. Provide a large paper bag for his belongings.

(*b*) Find out the mode of transportation—stretcher, chair, or ambulation—and assist the patient to dress accordingly.

(*c*) Take the bed card to the nurse and obtain the patient's records.

(*d*) Take the patient and the records to the ward to which transferred.

(*e*) Show interest in the patient. Reassure him as needed concerning questions about the new ward, about redirecting visitors, or delivery of mail.

(*f*) Turn over the patient and the records to the responsible person on the receiving ward.

(*g*) Exchange any property for which the transferring ward is responsible.

(*h*) Return hospital property to the transferring ward.

(*i*) Clean the patient's unit, following prescribed terminal cleaning methods.

f. Discharge of a Patient. The manner in which a patient is discharged is an important factor in the patient's total impression of the hospital. This impression may affect his willingness to continue his treatment or to return to the hospital if necessary.

(1) The ward officer determines the date of discharge and the conditions under which the patient is to be discharged.

(2) Once the order for discharge is written, the nurse or senior medical specialist in charge is responsible for seeing that the patient understands all orders that the medical officer may have given him to follow after discharge such as diet, medications, treatments, and followup appointments.

(3) Administrative procedures are started: completion of all entries on the clinical record; assembling of the clinical record; and forwarding of completed record through the appropriate chief of service to the registrar.

(4) The patient is given instructions concerning clearance. If the patient is physically unable to clear for himself, ward personnel accomplish the clearance for him. Whenever possible, this is done by telephone, using the clearance form provided.

(5) The patient is assisted in assembling his belongings such as bedside articles, clothing from the clothing room, and valuables from the Patient's Trust Fund office.

(6) The patient is escorted or directed to the disposition office. A check is made again to see that he has prescriptions needed and followup appointments.

(7) The patient's name is removed from the ward diet list, treatment list, and any ward worksheets.

(8) The patient's unit is cleaned, following prescribed terminal cleaning methods.

5–36. The Patient's Clinical Record

The patient's clinical record is prepared and maintained in accordance with AR 40–400. A brief introduction is included in this manual to give the medical specialist an overall view of his responsibility in assembling and maintaining the clinical record on the ward.

a. General. A clinical record includes the forms on which are recorded the medical record of a patient during one current, continuous episode of a disease, injury, or other condition. Although the accumulation of forms may be referred to collectively as the patient's chart, it is properly referred to as the clinical record file. It serves as a basis for planning patient care, providing communication between physicians and members of other professional groups, and presenting documentary evidence of the course of illness and treatment. Clinical records remain in the custody of the medical officer while the patient is under his care. They are always handled so that only persons officially concerned will have access to them. With the exception of those forms maintained in the Nursing Book Unit (para 5–37), the assembled record is usually kept in a clinical

record rack in the medical officer's office. The record is furnished as required to chiefs of services, consultants, and other authorized personnel.

b. Assembling the Record. Nursing personnel enter identification and assemble the forms in the prescribed order in the chart holder. They see that diagnostic and test reports are attached or inserted into the record file upon receipt on the ward, after these reports have been seen by the medical officer. Nursing Book Unit completed forms are transferred to the clinical record file. The prescribed order for assembling the various forms in a completed clinical record file is: (1) Clinical Record Cover Sheet; (2) Standard Forms (SF series); (3) Department of Defense Forms (DD series); and (4) Department of Army Forms (DA series). Each group is placed in numerical and chronological sequence.

c. Arrangement of Clinical Record. The actual forms included in a patient's clinical record will vary, and the arrangement while in custody of the medical officer is in accordance with local directions. The usual contents include the following forms:

(1) DA Form 3647 (Clinical Record Cover Sheet).

(2) SF 504 (Clinical Record—History, Part I).

(3) SF 505 (Clinical Record—History, Part II and III).

(4) SF 506 (Physical Examination).

(5) SF 509 (Clinical Record—Doctor's Progress Notes).

(6) SF 511 (Clinical Record—Temperature-Pulse-Respiration (Fahrenheit)).

(7) SF 514 (Clinical Record—Laboratory Reports).

(8) SF 519 (Clinical Record—Radiographic Reports).

(9) DD Form 640 (Nursing Notes).

(10) DD Form 728 (Doctor's Orders).

As further laboratory reports, consultation reports, or other forms are completed, they are added to the record. These include such forms as SF 513 (Clinical Record—Consultation Sheet), SF 522 (Clinical Record—Authorization for Administration of Anesthesia and for Performance of Operations and other Procedures), and DA Form 8-249 (Report of Unusual Occurrence).

d. Identification Data. Each form used must have complete and legible identifying data, whether typed, handwritten, or mechanically imprinted. With the exception of the form initiated in the Admission and Disposition Branch of the Registrar Division (DA Form 3647, Clinical Record Cover Sheet, in one of its variants), all forms are prepared on the ward. The cover sheet accompanies the patient to the ward when he is admitted or, in case of emergency, is forwarded to the ward at the earliest opportunity.

e. Use of Mechanical Imprinter. The mechanical imprinter supplied to the ward and the patient's addressograph plate (prepared in the Admission Office) save time in entering identifying data on clinical records. The imprinter and the addressograph plates are kept in the nurses' station. When the addressograph plate is used, it is inserted face up into the bed of the imprinter and the form to be imprinted positioned over the plate. The plate is removed from the imprinter after use and returned immediately to the designated ward file box.

f. SF 539 (Clinical Record—Abbreviated Clinical Record). The Abbreviated Clinical Record may be used in uncomplicated cases of brief duration in lieu of the following forms: SF 502 (Clinical Record—Narrative Summary), SF 504, SF 506, SF 511, SF 514, DD Form 640, and DD Form 728. An example of the use of this abbreviated form would be for an overnight admission for a patient undergoing a diagnostic test or a minor surgical procedure. The medical officer initiates this form, and both medical and nursing personnel enter pertinent information. Doctor's orders and nursing notes are written on the reverse side of SF 539.

5-37. Nursing Book Unit

The Nursing Book Unit commonly known as the "Kardex," is a visible-file book for centralized filing of designated clinical forms which are used and maintained by nursing service personnel. The Nursing Book Unit is kept at the nurses' station on the ward and is available only to authorized professional and nonprofessional personnel concerned with the care and treatment of patients. The following clinical record forms are maintained in the book unit: (1) DD Form 640 (Nursing Notes), (2) DD Form 728 (Doctor's Orders), and (3) SF 511 (Clinical Record—Temperature-Pulse-Respiration (Fahrenheit)—or SF 539 (Clinical Record—Abbreviated Clinical Record) *when authorized* to be used in lieu of these *three* forms—and (4) DA Form 8-250 (Nursing Care

Plan). It is the responsibility of the nurse in charge to check the book unit daily to insure accuracy and completeness of records. (The book unit is arranged and maintained in accordance with the method prescribed in AF 40–407.)

a. Arranging the Nursing Book Unit. Pockets numbered 1 through 40 are used as retainers for the specified clinical records of the individual patients. Identifying data on DD Form 728 (Doctor's Orders) show visibly through the margin of the file pocket and become the patient roster in the book unit.

(1) *Signal code tabs.* Colored plastic tabs provide pertinent information relative to the patient. The following standard color code is used: buff, bed number; green, doctor's orders; red, seriously ill (S.I.) or very seriously ill (V.S.I.); blue, nothing by mouth; and black, patient on pass. Other colored tabs may be adopted for additional information, depending on the requirements of the installation; *for example,* when patients from more than one service are on a ward, each service may be color coded—yellow may indicate general surgical or orange may indicate EENT.

(2) *Placement of color tabs.*

(*a*) *Buff tab.* This tab, furnished with the file book, is always placed to the extreme left.

(*b*) *Green tab.* This tab, the signal for doctor's orders, is always placed at the extreme right. When the doctor writes an order, he slides the green tab to the center to indicate an order has been written. When the order has been noted, the nurse (or responsible medical specialist) returns the green tab to the extreme right margin.

(*c*) *Red, blue, black tabs.* These tabs are inserted as needed, placing them to the right of the buff tab, but toward the left margin. The tabs must never extend beyond the center because they would then interfere with the movement of the green signal tab.

b. General Instructions for Recording Data.

(1) Only permanent black or blue-black ink is used since the clinical forms may be microfilmed or photostated. A conventional fountain or ballpoint pen is used. Entries may be written or printed but must be legible.

(2) If an incorrect entry has been made, a single straight line is drawn through the incorrect entry to indicate its elimination. Erasures and eradications invalidate records; therefore, such practice is prohibited. The person doing the recording authenticates the elimination or correction by placing his initials immediately above the entry eliminated or corrected. The right information is recorded following the correction.

(3) Nonprofessional personnel may be authorized to make appropriate entries.

NOTE

In discussing entries in the Clinical Record, Doctor's Orders, and Nursing Notes, reference to the nurse will also apply to the medical specialist if assigned these duties.

When a professional nurse is assigned, the entries are made under his immediate supervision. It is suggested that where a signature (first name, middle initial, last name) is required as in DD Form 640 (Nursing Notes) and in accounting for carrying out the doctor's order on DD Form 728 (Doctor's Orders) the rank be included with the signature of the medical specialist.

(4) Completed forms are filed in the patient's clinical record.

5–38. DD Form 728 (Doctor's Orders)

a. General. Study figure 5–27. Note that the form is divided into four sections: the date section, the orders section, the orders-discontinued section, and the administrative section.

b. Method for Writing Orders. The doctor writes his orders in the orders section, with each order (or item in the order) on a separate line. Since orders will be accounted for individually, the entry "Routine Orders" to infer a number of individual orders is prohibited.

(1) All orders for care and treatment of patients must be written and signed by the doctor.

(2) Verbal orders, whether given in person or over the telephone, must be confined to emergency stat. orders. Verbal orders will be accepted only by Army Nurse Corps officers or civilian registered nurses. The individual receiving the order enters it in the Doctor's Order and writes the doctor's name, followed by the receiver's signature (first name, middle initial, last name), rank or status, and a notation of how order was received such as by telephone. The doctor countersigns the order at the earliest possible time.

c. Method of Discontinuing Orders. Orders are terminated on the written direction of the doctor. The doctor enters the date and his initials on the column marked "Date disc," on the line corre-

THIS SIDE UP WHEN PLACING IN CLINICAL RECORDS FOLDER.

MICROFILM THIS SIDE FIRST

USE IMPRINT FROM ADDRESS PLATE OR MIMEOGRAPH.

Thompson, Ray A. MSG
174397 RA 6250852

Ward B1 178-29-5537
USAH FT. Splendid Tex 16 Oct 7-

YEAR 197-	DOCTOR'S ORDERS ORIGINAL ORDERS SIGNED BY DOCTOR. WHEN COPIED, NURSE SIGNS DOCTOR'S AND OWN NAME.	DATE DISC. / DOCTOR'S INITIALS	DATE 16 Oct SHIFT D E N	17 SHIFT D E N	18 SHIFT D E N	19 SHIFT D E N	20 SHIFT D E N	21 SHIFT D E N	22 SHIFT D E N
	0915 P.S.								
16 Oct	Type and cross match for 3 units whole blood		PS						
	0915 P.S.								
	N. Phenobarbital 10 mgm. I.M. H.S.		RG						
	0915 P.S.								
	N PO after 2400		CM						
	0915 P.S.								
	Insert gastric tube 0600, 17 Oct		CM						
	0915 P.S.								
	Atropine 0.2 mgm } 0730			PS					
	0915 P.S.								
	Demerol 50 mgm. } 17 Oct			PS					
	0915 P.S.								
	To OR on call 17 Oct			PS					
	Jadard Newell, CPT, MC								

DD FORM 1 JUL 53 728 REPLACES DD FORM 639, 1 MAY 52; DD FORM 641, 1 MAY 52; AND DD FORM 642, 1 MAY 52, WHICH ARE OBSOLETE.

Figure 5-27. Completed DD Form 728 (Doctor's Orders).

YEAR 19 7–

DOCTOR'S ORDERS (Con't)

ORIGINAL ORDERS SIGNED BY DOCTOR. WHEN COPIED, NURSE SIGNS DOCTOR'S AND OWN NAME.

DATE DISC. / DOCTOR'S INITIALS

DATE 16 | 17 | 18 | 19 | 20 | 21 | 22 — SHIFT — D E N

16 Oct — Morphine Sulfate 10 mgm. Stat (Telephone order) NIS RD
John S. Arnold CPT, MC / Rita Green
0915 A.H.

17 Oct — NPO — 18 Oct — JSA
0915 A.H.

Continuous gastric suction — 19 Oct — JSA
0915 A.H.

Intake and output — 23 Oct — JSA
0915 A.H.

Add 2,000 cc 5% Glucose in D/W to I.V.
0915 A.H.

Demerol 100 mgm IM q3-4hr. PRN. — 21 Oct — JSA
0915 A.H.

Procaine Penicillin 300,000 u BID — 20 Oct — JSA
0915 A.H.

Ambulate this p.m. and 3x daily thereafter — 20 Oct — JSA

John S. Arnold CPT, MC
0715 A.H.

18 Oct — Sips of water ad lib. — 19 Oct — JSA
0915 A.H.

2000 cc 5% Glucose in D/W I.V.
0800 A.H.

19 Oct — Clamp gastric tube - give water on tea 30cc q hr. — 20 Oct — JSA

John S. Arnold CPT, MC
0800 A.H.

20 Oct — Remove gastric tube
0800 A.H.

Bland diet with soda feedings
0800 A.H.

Ambulatory ad lib

John S. Arnold CPT, MC
0730 A.H.

21 Oct — Darvon capsules 2g 4hr. PRN

John S. Arnold, CPT, MC

Copied Orders 23 Oct 7– — Oct — 23 24 25 26 27 28 29

20 Oct — Ambulatory ad lib — P S — G C R M

20 Oct — Bland diet with soda feedings — A S — G R

21 Oct — Darvon Capsules 2g 4hr PRN — G R

John S. Arnold CPT, MC / Ria Smith, LT, ANC — JSA

AT THE END OF EACH SHIFT, NURSE WHO COMPLETED ORDERS WILL PLACE OWN INITIALS IN PROPER COLUMN.

SERVICE NO.	WARD	
RA 6250852	B1	178-29-5537

NAME	GR	REGISTER NO.	AGE	DATE OF ADM.	DIAGNOSIS
Thompson, Ray A.	MSG	174397	44	16 Oct 7–	Ulcer, duodenum Gastritis, acute

Figure 5–27—Continued.

sponding to and opposite the order he desires discontinued. Automatic stop orders, as established by local policy, will be noted by the nurse to indicate order is discontinued.

d. Procedures for Accounting for and Charting of Doctor's Orders. All orders are accounted for directly on DD Form 728 and, with the exception of narcotic orders, stat. orders, and p.r.n. orders, no further notations on their administration are transcribed in the nursing notes, unless professional judgment indicates need for additional information. Although practice may vary in minor details from hospital to hospital, AR 40–407 states that orders are accounted for as follows:

(1) *All orders.* When order is noted, the nurse or responsible individual will enter the time and initials on the same line as the order to indicate that appropriate action has been initiated.

(2) *Continuing orders.* All continuing orders will be accounted for in columns marked "D," "E," and "N" (day, evening, and night) once each 8-hour period. The responsible person will record initials on line opposite each order and in appropriate column to signify that the order was carried out during that period.

Example

Diet—Hospital regular diet
Medication—Prednisone 0.005 gm. q. 4 h.
Treatment—Hot soaks to left heel, q. 2 h.
Laboratory Examination—Urinalysis, daily for 7 days

(3) *One-time consultation, X-ray, and laboratory examinations, treatments, p.r.n., narcotic, and stat. orders.* Accomplishment of this category of orders will be noted in the Nursing Notes.

Example

Chest X-ray
Psychiatric consultation
Urinalysis
Morphine sulfate 0.015 Gm stat., then q. 4 h. p.r.n.

e. Copying Orders. When the weekly spaces in the administration section are filled, a line is drawn across the entire page at the level of the last entry. Directly below this line the new dates for the coming week are written. All orders still in effect are copied, including the date and the name of the doctor who wrote the original order. The individual copying orders will authenticate them by signature and rank or status. The word "copied" and the date will precede the copied orders. The responsible physician will then review the copied orders and place his initials over the signature.

5–39. DD Form 640 (Nursing Notes) (fig. 5–28)

a. General. Although the quantity of nursing notes must be kept to a minimum, they must contain objective observations of the patient's condition and pertinent data relative to his nursing care. They should include observations of physical and mental status, symptoms, response to therapy, and change noted in any aspect of these. Since nursing notes aid in diagnoses, furnish reference material for research and teaching, and provide important evidence in event of litigation, it is essential that all entries be made with these factors in mind. The person making the entry should—

(1) Record notations first on the left half and, after these are filled, on the right half of each page.

(2) Sign each entry. During hours when only one individual is on duty or when the patient is the complete responsibility of one individual for the entire tour of duty, the signature may be recorded after the final entry.

(3) Make at least one entry for each acutely ill patient during each 8-hour period. (One entry per week is considered sufficient for a long-term patient whose care requires only routine nursing measures.)

b. Charting of Specific Information in Nursing Notes.

(1) *Admission notes.* Date, time, and manner of admission (ambulatory, wheelchair, or stretcher) are included, plus a brief, clear description of symptoms and pertinent observations (condition of skin, presence of decubiti, burns, wounds, dressings, or prostheses), TPR, BP, height, and weight determination are noted at time of admission. The patient is questioned about allergic reactions and the reply noted. Additional admission notes are governed by the special service to which the patient is admitted. A locally produced form may be used for initial recording of admission notes but the information is then transcribed to the Nursing Notes.

(2) *Discharge notes.* Date, time, and manner of discharge (ambulatory, wheelchair, or stretcher) are noted.

DATE	7	DATE	8

INSTRUCTIONS:
1. This form overrides doctor's orders DD Form 722.
2. Patient's name must be inserted under columns (1) and (2) for microfilming identification.

3. Fold on this scoring and crease firmly.

DD FORM 1 APR 55 640 REPLACES DD FORM 640 1 MAY 52, WHICH MAY BE USED

NURSING NOTES

4. Fold back on this scoring and crease firmly.

DATE	1	DATE	2
16 Oct '90	0800 - Admitted ambulatory to ward	16 Oct	(cont.) and cross matched.
	with complaint of intermittent		1000 - To X-ray for chest film
	epigastric pain. Diagnosis of		1400 - Surgical prep by OR personnel.
	duodenal ulcer. Has no pain at		Pia Smith 1LT, ANC
	present. For surgery 17 Oct.		1530 - Morphine Sulfate 10 mgm IM.
	B/P 100/90 TPR 98°-88-18		for severe epigastric pain.
	Wt. 164 lbs. Ht. 69½"		Rita Green, R.N.
	No allergies noted by patient		1600 - Pain Relieved
	Seen by CPT Arnold		0600 - Slept for long intervals
	Pia Smith 1LT, ANC		0605 - Gastric tube inserted
	0830 - Urine specimen to lab		without difficulty. 150cc clear
	0900 - To Lab for CBC and type		fluid aspirated. Carole March R.N.

NAME Thompson, Clay M. 178-29-5537 REGISTER NUMBER 174397

Figure 5–28. Completed DD Form 640 (Nursing Notes).

DATE	3
17Oct	0730 - Demerol 50 mgm. Atspere 0.2 mgm given I.M. as pre-operative medication. Pia Smith, 1LT, ANC
	0810 - To O.R. Pia Smith, 1LT, ANC
	1230 - Received on recovery, unwanted Operation: Gastric Resection. Color good, pulse bounding, easy respiration. Dressing dry. Whole blood continued. I.V. from O.R. BP 100/80 TPR 99² (R) 88-18. Gastric tube to suction. Ann Adams, RN
	1300 - Resting. Color good. Whole

DATE	4
17Oct	(cont.) blood absorbed with no untoward reaction. 1000 cc 5% Glucose in D/W added to I.V. Ann Adams, R.N.
	1445 - Demerol 100 mgm. I.M. for pain at operative site. Ann Adams, R.N.
	1500 - Blood tinged fluid from gastric tube, BP stable with range from 100/80 to 110/78. Tube stable. Pain relieved. Virginia Brown, 2LT, ANC
	1800 - Voided 520 cc. Robert Rose SP4

DATE	5
17OCT	1715 - I.V. absorbent B.B.
	1930 - 1000 CC. 5% Glucose D/W added to I.V. Gastric drainage Clearing. Demerol 100 mgm. given I.M. for severe abdominal pain. Betty Beatty CPT, ANC
	2000 - Pain has subsided.
	2130 - Ambulated with some difficulty. Vital signs remain stable.
	2230 - Sleeping. Betty Beatty CPT, ANC

DATE	6
18Oct	2400 - Patient resting quietly. Vital signs stable.
	0100 - I.V. absorbed and discontinued. Gastric drainage clear.
	0145 - Demerol 100 mgm. given I.M. for abdominal pain. Clara Clark R.N.
	0230 - Pain has subsided.
	0600 - Fairly comfortable night. Turns and coughs with minimal assistance. Clara Clark, R.N.

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Figure 5-28—Continued.

(3) *Medications and treatment.* Only narcotic orders, stat., and p.r.n. orders for medications and treatments are charted on DD Form 640. A complete entry is made each time they are administered, including the time, name of medication or treatment, and the reason for administration. If for any reason a scheduled medication or treatment is not given, this fact and the reason is entered.

(4) *TPR and BP recordings.* These determinations, transcribed from DA Form 8-220 (TPR Record (Worksheet)) are entered on the Nursing Notes when SF 539 (Abbreviated Clinical Record) is used. Normally, these determinations will be recorded on the graphic portion of SF 511 (Temperature-Pulse-Respiration). Sudden or marked changes in the vital signs may be indicated on the Nursing Notes as well as on SF 511.

(5) *Intake and output totals.* These totals, transcribed from DD Form 792 (Nursing Service —Twenty-Four Hour Patient Intake and Output Worksheet) are entered on the Nursing Notes only when SF 539 is used. Normally, these totals will be recorded on SF 511.

(6) *Laboratory and X-ray examinations, off-ward clinic visits.* Information relative to date, hour, laboratory, or clinic visited and type of examination is noted.

(7) *Special procedures.* Diagnostic and therapeutic procedures, special nursing measures performed at the bedside, and unusual occurrences are charted in Nursing Notes. Notations include time, name of procedure, by whom performed, specimen obtained or brief description of what was done, and the reaction of the patient.

5-40. SF 511 (Clinical Record—Temperature-Pulse-Respiration (Fahrenheit))

This form is a graphic form used to chart a number of the patient's physical responses such as vital sign determinations, intake and output, and weight. In using SF 511, special attention must be given to the entry blocks indicating hospital day, postoperative day, date, and hour blocks.

a. Hospital Day and Postoperative Day. The day the patient is admitted to the hospital is considered his first hospital day and is so entered on SF 511 (fig. 5-29). The day surgery is performed is the surgery day, not the first postoperative day.

b. Date and Hour Blocks. These entries are divided into seven major columns, one for each day for one week. Each daily column is subdivided into 2 parts (fig. 5-29) to be used as a.m. and p.m.; each subdivision is further divided by two vertical dotted lines.

NOTE

The dots in the lines divide the vertical spaces on the graph into 5 even divisions, each division corresponding to 0.2 degree of temperature or 2 pulse beats.

(1) The symbols illustrated on SF 511 are used—a solid dot for temperature and an open dot for pulse. These symbols are placed between the columns and rows of dots and joined by a straight line (temperature symbol to temperature symbol, etc.).

(2) If the route of determining temperature is other than oral, it should be indicated by (R) for rectal and (A) for axillary.

(3) The number of respirations are written in digits in the space for "Respiration Record."

(4) Blood pressure will be entered on the indicated row below the graphic portion.

(5) Frequent blood pressure determinations may be recorded on the graphic portion of the form by entering an "X" at points equivalent to the systolic and diastolic levels and connecting the two with a vertical solid line.

c. Special Data Section. In addition to blood pressure, height, and weight, total intake and output for 24-hour periods may be recorded in this area. This information is transcribed from DD Form 792 (Nursing Service—Twenty-Four Hour Patient Intake and Output Worksheet).

d. Transcription of Data. Use information from DA Form 8-220 and DD Form 792 for transcription of data to the graphic record. (When the medical specialist is first learning to chart information under the nurses' immediate supervision, this transcription of data is often the first entry he makes on clinical records.) Use care and give undivided attention to the assignment.

5-41. DA Form 8-250 (Nursing Care Plan)

a. General. This form is maintained in a separate book unit. The patient identification data should be entered as indicated. The purpose of this form is to assist the nurse in planning individualized nursing care for those patients designated by the clinical head nurse. All persons involved in the care of the patient contribute to the

Standard Form 511
Rev. August 1956
Bureau of the Budget
Circular A—32

U.S. GOVERNMENT PRINTING OFFICE : 1961 O—614284

CLINICAL RECORD — **TEMPERATURE—PULSE—RESPIRATION** FAHRENHEIT

HOSPITAL DAY		1		2		3		4		5		6	7
POST-OPERATIVE DAY				OR		1		2		3		4	5
MONTH-YEAR	DAY	16		17		18		19		20		21	22
Oct 19 7-	HOUR	6 10 2	6 10 2	6 10 2	6 10 2	6 10 2	6 10 2	6 10 2	6 10 2	6 10 2	6 10 2	6 10 2	6 10 2

PULSE (O) / TEMP. F (●): 105° 104° 103° 102° 101° 100° 99° 98.6° 98° 97° 96° 95°; 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40

TEMP. C: 40° 38.9° 37.8° 37° 36.1° 35°

(Centigrade Equivalents, for Reference only)

RESPIRATION RECORD: 18 · 20 16 | 20 · 16 · 16 | 20 · 24 · 20 | 24 · 24 · 20 | 20 · 18 · 20 | 20 · 16 · 20 | 20 · 20 · 18 | 20 · 20 · 18

Record special data only when so ordered													
	BLOOD PRESSURE	108/70	108/80	110/78	108/70	110/78	108/70	100/70	108/70				
	HEIGHT: 69½ WEIGHT→	164											
	Intake												
	Oral			0		0		150					
	I. V.			3500		3000		2000					
	Total			3500		3000		2150					
	Output												
	Gastric Drainage			1650		1100		200					
	Urine			1300		2100		1600					
	Total			2950		3200		1800					

PATIENT'S IDENTIFICATION (For typed or written entries give: Name—last, first, middle; grade; date; hospital or medical facility)

Thompson, Ray A. MSG 178-29-5537
13 Oct 7-
USAH, Ft SPLENDID, Texas

REGISTER NO. 174397

WARD NO. 81

TEMPERATURE—PULSE—RESPIRATION
FAHRENHEIT
Standard Form 511
511-108-01

Figure 5–29. Completed SF Form 511 (Temperature-Pulse-Respiration).

development of the plan, although the head nurse or his designated professional nurse representative is responsible for its preparation. Entries are made in pencil to permit modification as required.

b. Contents. There are three essential parts of a nursing care plan.

(1) The medical components are those aspects of the treatment ordered by the medical officer; *for example,* "Give oxygen at 8 liters per minute by face mask p.r.n."

(2) General nursing aspects include hygienic care and comfort measures, dietary and fluid balance requirements, and physical activity limitations of the patient which are not specifically governed by medical orders.

(3) Special components of nursing are those which result from the individual's response to the hospital experience. Identification of the needs and nursing requirements of each of the patients requires assessment of the individual's likes and dislikes, worries and fears, and reassessment of them on an ongoing basis.

Each item identified should be accompanied by a suggested nursing approach.

c. Use. If the nursing care plan is to be more than a paper exercise, it must be *known* to all nursing team members and *used.* Before starting his care of a patient, the medical specialist should always check the nursing care plan. To be of value, the nursing care plan must be kept current. The medical specialist caring for the patient can pick up valuable clues, and he must pass this information on to the clinical head nurse for inclusion in the plan.

d. Disposition. This form does not become part of the patient's clinical record and will be destroyed when no longer required.

5–42. Observation of Patients

Observation of a patient is taking notice of signs and symptoms which indicate the patient's physical or mental condition. Observation is essential at all times, from the patient's admission until his discharge. The doctor depends upon nursing personnel to observe and to recognize, report and record the patient's condition accurately during the day and night. Effective observation helps (1) to aid the doctor in making a diagnosis and in prescribing treatment, (2) to determine the effects of a prescribed course of treatment, and (3) to modify nursing care to fit the needs of patient.

a. Signs and Symptoms. Signs and symptoms are evidences of a patient's condition and of any disability. Signs are objective evidences that can be detected by one of the senses (sight, hearing, touch, smell, or taste). They can be noticed by an observer as well as by the individual experiencing them; for example, a rash can be seen, a swollen area can be seen and felt, a snoring respiration can be heard, the odor of a patient's body can be smelled. Symptoms are any functional, rather than structural, evidences; they may be objective and therefore noticeable by an observer, as well as by the individual experiencing them—or they may be subjective (the individual's own sensations). Examples of subjective symptoms are pain, nausea, and ringing in the ears.

b. Causes of Symptoms and Signs. There are three main groups of symptoms and signs to know in order to become efficient: (1) those caused by the disease or injury with which the patient suffers, (2) those relating to nursing care such as cramps resulting from too rapid administration of enema fluid, and (3) those caused by the medicine given to the patient (*for example,* morphine can produce slow breathing, drowsiness, and pinpoint pupils).

c. Training and Developing Power of Observation. To increase skill in observing the patient's condition, the specialist should (1) increase his background knowledge, (2) take an active interest in the patient, (3) develop a sympathetic understanding of the whole patient, and (4) strive to be a good listener, attentive and accurate. The specialist can increase his knowledge by conscientious and accurate use of all senses and by accumulating a fund of information from books and from leaders on the patient care team concerning the symptoms to expect in various patient conditions. He can give attentive interest when the patient states how he feels. He can also try to anticipate the patient's emotional and physical needs and discomforts and do what can be done appropriately to relieve him. Lastly, he can be accurate and conscientious in the performance of procedures which uncover signs of illness, such as taking the pulse, measuring intake and output, and taking blood pressure.

d. Reporting and Recording Observations. Reporting should be done away from the patient's bedside and out of his sight and hearing if possible, in order to reduce any anxiety or misunderstanding. Any comments made in the patient's presence should be appropriate to what the pa-

tient needs to know or to hear about his condition. Plain, everyday, factual language is used in reporting and recording. The patient is always identified by name, and the time the observation was made is noted.

(1) Any nursing measure provided should be reported, including a statement as to whether the measure seemed to help or not.

(2) Complaints and signs of pain should be reported as precisely as possible. Such things as location, plus any statement from the patient that the pain is sharp, dull, aching, throbbing, constant, or knifelike, are important. If the patient is being quoted, his exact words should be used. *For example,* if the patient says, "I feel terrible," the report should not say, "the patient complains of malaise." The patient should be asked how long he has had the pain. In observing him, particular note should be made of—

(*a*) Position assumed to relieve the pain. Is he bent over, curled up in bed, unwilling to take a deep breath or to straighten an arm or leg?

(*b*) Measures already used to relieve the pain. Has he had a medication? Did the medication relieve him for a period of time? Did any change of position relieve him?

e. Observation to be Made. It is important to note signs of health, indications of returning strength, and a feeling of well-being, as well as noting disabilities and signs of distress. The specialist must become aware of the patient's interest in his personal appearance and grooming. (For women patients, interest in applying lipstick and concern about hair styling is noteworthy; for men, interest in shaving, use of aftershave lotion, and a haircut.)

(1) It is particularly necessary to be conscious of a patient's eating and drinking habits (appetite, thirst), sleeping habits (naps during the day and restless or wakeful intervals at night), and changes in respiratory and pulse rates in relation to bed rest, ambulation, and treatment procedures.

(2) A guide or checklist for observing the patient in relation to his environment, his own general appearance, functioning of body systems, and treatment measures employed is given in table 5–1.

5–43. Vital Signs

a. General. Temperature, pulse, respiration (TPR) and blood pressure (BP) are called vital signs (VS) because they are important signs of the body for indicating the condition of the patient. The measurement of these signs and their close relationship aid the doctor in making a diagnosis and prescribing treatment. They also help to determine the amount and kind of nursing care necessary. For greater accuracy, these signs are checked while the patient is at rest. Any marked deviation from a normal range is a signal of distress sent out of the body. TPR and BP measurements of every patient are taken and recorded upon admission. Subsequently, TPR measurements are taken routinely on all patients according to ward policy, often on a twice-daily schedule. BP is taken on an individual basis. The ward officer will specify the hourly interval for an individual patient by writing an order; *for example,* TPR and BP q. 4 h., or VS q. 4 h.

b. Temperature. Temperature is the degree of heat in the body. It is determined by the balance maintained between the heat produced and the heat lost through normal body processes. Heat produced is distributed by the circulating blood. Excessive heat is eliminated through the skin, lungs, and excreta. When the balance is disturbed, deviations in body temperature result.

(1) *Normal temperature.* The temperature tends to be lower in the early morning after a night of rest and higher in the evening after a day of activity. The range is between 97 and 99 degrees when measured by a mouth thermometer. The average normal temperature is considered to be 98.6 degrees F.

(2) *Abnormal temperature.*

(*a*) *Fever.* An elevated temperature is called a fever. It is usually one of the first indications of an infection or other disease process.

(*b*) *Subnormal.* Deviations which persist below the average normal temperature are the result of lowered vitality. A subnormal temperature may be caused by shock, starvation, or a long lasting illness. It indicates body resistance is low.

c. Pulse. Changes in the character of the pulse may be caused by: (1) any factor that interferes with the function of the heart, (2) the volume of circulatory blood, and (3) the elasticity of the artery wall. Characteristics and rate of the normal pulse vary slightly in individuals.

(1) *Normal pulse.* Generally, the normal pulse is regular in rate, rhythm, and force (strength). The average range is 60 to 80 pulse beats per minute, but normal variations occur,

Table 5-1. Guide for Nursing Observations

Observation	Checklist			
1. *Ward Environment:*				
General appearance	Clean	Orderly	Spacious	Crowded
Noise	Loud talking	Banging equipment	Radios, T.V.	Unanswered telephone
Ventilation	Fresh air	Unpleasant odors	Drafts	Stale, smoky air
Temperature	Check wall thermometer	Cool for sleeping (below 70°)	Warm for treatments (70° or above)	If fans used, not blowing on patient
Light	Glaring	Shining in eyes	Adequate for reading	Shaded properly
Patient Units	Clean	Orderly	Signal cord within reach	Bedside stand within reach
2. *The Patient:*				
General appearance	In pain	Fatigued	Looks well	Looks ill
Behavior	Restless	Unconscious	Depressed	Responsive
Position	Able to move self	Favors one position	Slides down in bed	Comfortable and in good alinement
Bedding	Clean	Disarranged	Constricting to feet	Foundation wrinkle free
Appliances/Apparatus	What is being used?	Operating correctly?	Safety factors involved?	Patient reactions?
Intake (food and fluids)	Is drinking water available?	Can patient reach water?	If intake restricted, is a sign posted?	Is I & O record at bedside?
Output (frequency, amount, and character).	Vomitus	Urine	Feces	Drainage (wounds, catheters, and all tubes)

with increased rate associated with exercise and emotional activity. Any irregularities in rate, rhythm, and force are reported immediately. In addition to taking the pulse at the same time as the temperature, the pulse is also taken routinely before and after such activity as getting out of bed the first time or before receiving medications affecting the pulse.

(2) *Pulse irregularities.* The term "thready" describes a weak, rapid pulse. The term "arrhythmia" describes both irregular intervals between beats and beats of unequal force. An irregular pulse must be counted for one full minute; a regular pulse may be counted for 30 seconds and then multiplied by 2.

d. Respiration. The complete cycle of inhalation (breathing in) and exhalation (breathing out) is one respiration. Normal respiration is carried on automatically without effort and is regular in rate, rhythm, and depth. The normal range in adults is 16 to 20 respirations per minute. Since respirations can be consciously controlled to some extent, they are counted when a patient is unaware of the procedure, if possible. Any disease or injury that affects the lungs, chest wall, or oxygen-carrying ability of the blood will usually affect the respiratory rate or the effort needed to inhale and exhale. If breathing movements are painful, the patient is reluctant to take a breath of sufficient depth to aerate his lungs, and must be reminded and assisted to take periodic deep breaths at regular intervals. Terms used to describe irregularities in respirations include—

(1) *Dyspnea.* Difficult or labored breathing. Dyspnea that is relieved when the patient sits in an upright position is orthopnea.

(2) *Apnea.* Temporary absence of breathing. A period of apnea may last for 30 to 60 seconds. Normally, after a brief period of apnea, the carbon dioxide level in the blood builds up suffi-

ciently to signal the respiratory center in the brain to stimulate normal breathing movements. A period of apnea followed by a series of rapid breaths recurring in a cycle is called Cheyne-Stokes respirations. This type of periodic breathing may be observed in critically ill patients and is considered a sign of approaching death.

e. Blood Pressure (BP). The term blood pressure is usually interpreted to mean the pressure of blood within the arteries. (Paragraph 2-37*b* defines blood pressure, systolic pressure, and diastolic pressure.) BP is written as a fraction, with systolic pressure the numerator and diastolic pressure the denominator; *for example,* in a BP reading of 120/80, 120 is the systolic pressure and 80 is the diastolic pressure. For adults, the normal range of systolic blood pressure is 100–140; normal range of diastolic pressure is 60–90. Pulse pressure is determined by subtracting the diastolic from the systolic pressure. (If the BP is 120/80, the pulse pressure is 120–80 or 40.) Pulse pressure indicates how well the heart and blood vessels are coordinating. Abnormalities of blood pressure are—

(1) *Hypertension.* Abnormally high BP. It is associated with the disease condition of arteriosclerosis (hardening and narrowing of the arteries).

(2) *Hypotension.* Abnormally low blood pressure. It is associated with weakened heart action and lowered circulating blood volume as in shock.

f. Recording TPR and BP. These vital signs are recorded immediately on the worksheet (DA Form 8-220, Temperature, Pulse, and Respiration Record) by the person who takes them.

5-44. TPR Measurement

a. Thermometers. Body temperature is measured by a clinical thermometer, a glass shaft with the stem calibrated in 0.2 degree Fahrenheit (F). Within the stem is a hollow tube extending from a bulb end. The bulb contains mercury which, when warmed, expands and rises in the tube.

(1) *Types of clinical thermometers.* Two types, oral and rectal, are commonly used. Each is identified by the shape of the bulb. The standard oral thermometer (fig. 5-30) has a long slender bulb, but occasionally an oral thermometer with a short stubby bulb is supplied. The standard rectal thermometer has a large rounded or pear-shaped bulb (fig. 5-30) specially designed to prevent damage to the mucosa when it is inserted into the rectum.

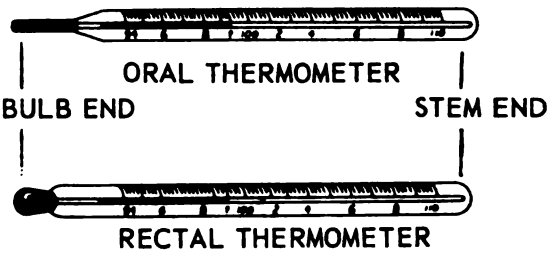


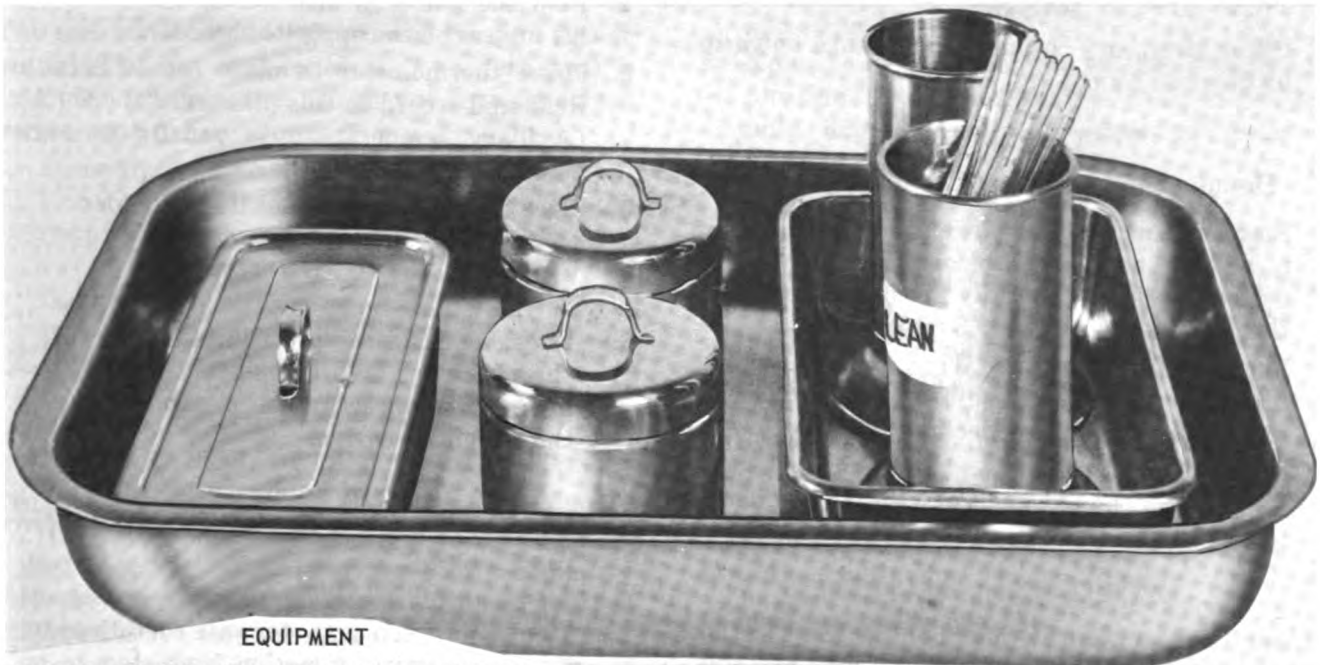
Figure 5-30. Types of thermometers.

(2) *Reading the thermometer.* Hold the thermometer by the stem end and notice the ridge side, with numbers below the ridge and lines indicating 0.2 fractions above. With ridge edge at eye level, rotate the thermometer slowly forward and backward until the column of mercury is seen. Read the highest level of the column to the nearest 0.2 degree. Notice that an arrow points to the average normal temperature mark, 98.6 degrees.

(3) *Shaking down the thermometer.* Grasp the stem end firmly. Stand in a clear space to avoid striking anything with the thermometer, and with a sharp downward wrist motion, shake the thermometer. Check the mercury column, and repeat the shaking procedure, if necessary, to lower the column to the 95 degree mark. Always check and shake down the thermometer p.r.n. before using it.

b. Use and Care of Thermometers. Thermometers are fragile and must be handled carefully for safety and economy. The number of thermometers available for use should correspond to the patient census. Each patient is provided with a clean, sanitized thermometer each time his temperature is taken.

(1) *CMS thermometer exchange method.* A present-day recommended method for use and care of thermometers, oral and rectal, is to obtain clean thermometers in the required quantity daily from CMS and to return used thermometers daily to CMS for decontamination and processing for reissue. In CMS units that have ethylene-oxide-gas-sterilization capability, the thermometers are sterilized, between use—the alternative method is by mechanical cleaning and chemical soaking for disinfecting. In either method, thermometers are usually issued from CMS in paper envelopes. The paper protective covering is removed at the bedside or other patient-use area just before the thermometer is used in order to reduce handling of clean thermometer.


EQUIPMENT
TRAY, 15" X 9" X 2", WITH FOLLOWING ARTICLES:
1 TRAY, 8" X 5" X 2" (TO CARRY TO BEDSIDE) TO CONTAIN:
1 HOLDER, LABELED "CLEAN," WITH THERMOMETERS.
1 HOLDER, LABELED "USED" (TWO-THIRDS FILLED WITH WATER)
BASIN, OBLONG, COVERED (TWO-THIRDS FILLED WITH WESCODYNE)
1 CONTAINER, SMALL, COVERED, WITH PAPER WIPES
1 CONTAINER, SMALL, COVERED, WITH 2" X 2"
GAUZE SQUARES (SATURATED WITH WESCODYNE)
THERMOMETERS

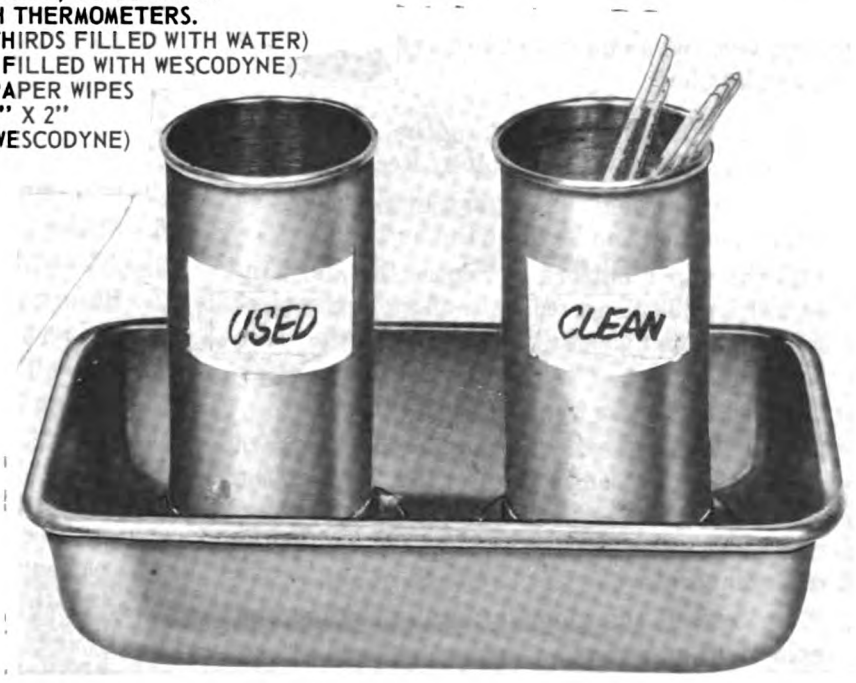


*Figure 5–31. Standard oral thermometer tray.**

* Standard rectal thermometer tray is the same as the oral tray with the following exceptions:
Rectal thermometers, pear-shaped bulb.
Tube of lubricant jelly.
All containers are labeled "Rectal" in black paint.

(2) *Standard thermometer tray method, ward care* (fig. 5–31).

METHODS OF TAKING TEMPERATURE

ORAL TEMPERATURE

This is the most convenient method and can be used for adult responsive patients.

CAUTION

Wait 15 minutes before taking the temperature if the patient has just had a hot or cold drink or has been smoking. Request patient to remove any chewing gum from the mouth. Instruct the ambulatory patient to be seated.

Procedure

1. Check clean, dry thermometer. Shake down to 95 degrees, p.r.n.

CAUTION

Handle thermometer by stem end only.

2. Place bulb end under patient's tongue, where it will be near large blood vessels. Instruct patient to close lips firmly around stem. Leave thermometer in place for 3 minutes.
3. Remove thermometer. Wipe with a tissue square from stem to bulb to remove saliva. Read. Record, using decimal; *for example,* "98.4."
4. Place thermometer in "used" oral thermometer holder.

RECTAL TEMPERATURE

This is the most accurate method. It is used for all infants and young children and for adults who are unconscious or irrational, or who have difficulty breathing with the mouth closed. It is not used on patients who have had rectal surgery or have had a rectal disorder.

Procedure for Taking the Temperature of an Adult by Rectum

1. Screen the patient. Then turn him on his side (Sims position) and expose the buttocks.
2. Lift the upper buttock to expose the anus. Insert the well-lubricated bulb of the thermometer slowly and carefully about 1½ inches into the anus.
3. Hold thermometer in place for 2 minutes.
4. Remove thermometer. Wipe downward with paper tissue. Read. Record with "R" on the worksheet; *for example,* "99.8 (R)." (A rectal temperature is usually 1 degree higher than oral temperature.)
5. Place rectal thermometer in "used" rectal holder.

AXILLARY TEMPERATURE

When temperature can be taken neither orally or rectally, it can be taken under the arm where the thermometer bulb can be surrounded by body tissue. To take the temperature by axilla, use an oral thermometer.

Procedure

1. Pat the armpit dry with a tissue or towel. Place the bulb of the oral thermometer in the center of the armpit.
2. Fold the patient's arm across his chest with his fingers on the opposite shoulder.
3. Leave thermometer in place for 10 minutes. Read and record in this manner: "100.2 (A)." (Axillary temperature is usually 1 degree lower than oral temperature.)
4. Place thermometer in "used" oral holder.

NOTE

If individual technique is used, follow the same cleansing procedure as for oral thermometers before replacing the thermometer in the container of germicide at the patient's bedside.

Care of Equipment

1. Remove contaminated thermometers from "used" holder.
2. Cleanse thermometers with gauze square saturated with green soap. Cleanse each thermometer with a twisting motion from stem to bulb end. Rinse under running water.
3. Place thermometers in a basin of Wescodyne solution, 150 ppm, for 30 minutes.
4. Wash and dry thermometer holders. Place layer of cotton in the bottom of each.
5. Remove thermometers from Wescodyne solution, rinse under running cold water and dry.
6. Shake down thermometers and return to "clean" holder.
7. Return small tray with holders to proper space on large tray.
8. Boil all containers on thermometer tray and change the Wescodyne solution once daily.

NOTE

When individual thermometer technique is used, the thermometer is kept at the patient's bedside in a small container two-thirds filled with Wescodyne. A container of gauze squares saturated with green soap is provided for mechanical cleansing of the thermometer from stem to bulb end before returning it to the container.

TAKING THE PULSE

The pulse may be taken wherever an artery lying near the surface of the body can be pressed against firm tissue. Pulse is usually taken by applying slight pressure to the radial artery on the thumb side of the wrist. A watch with a second hand is used to time the pulse rate.

RADIAL PULSE MEASUREMENT

The patient should be relaxed and lying in bed or seated. The arm used (preferably the left arm) is extended in supination (palm up) and supported on the bed or chair arm.

1. Place tips of first, second, and third fingers on pulse point. (Do not use the thumb as the thumb has its own pulsation which can be confusing.) Press fingers firmly to feel pulse. Count pulse. Remember, any irregularity in pulse requires one full minute. While counting, note the force and rhythm.
2. Record count; note irregularity p.r.n.

APICAL-RADIAL PULSE MEASUREMENT

This procedure is ordered by a medical officer for an individual patient who has a questionable radial pulse rate due to a heart or circulatory disorder. A stethoscope is used for counting the apical pulse. In this procedure, there is simultaneous counting by two people of the apical pulse of the heart and the radial pulse. The difference between the apical and the radial pulse, when counted simultaneously, is called pulse deficit. When the count is ordered for a female patient, the patient is screened and female specialists do the procedure.

Procedure

1. Explain procedure to reassure the patient.
2. Uncover the left anterior chest area. Locate the apical beat, below the left nipple (5th intercostal space). Listen for clear heart sounds through the stethoscope.
3. Tell assistant to locate radial pulse.
4. Begin simultaneous count on signal "start." Count for one full minute. (The apical count will be the same or higher than the radial count.)
5. Repeat procedure to recheck if necessary.
6. Record apical and radial count immediately on worksheet. Report any unusual observation, stat.
7. Readjust patient's clothing and bed covers.
8. Record in DD Form 640 (Nursing Notes).

TAKING RESPIRATION

After counting the pulse and while the fingers are still on the wrist, take the respiration count. (If the patient thinks his pulse is still being counted, he has less tendency to control breathing consciously.)

1. Watch rise and fall of the chest or upper abdomen. Count each rise, and continue to watch and count for one minute.
2. Note the depth, rhythm, and ease of each respiration in addition to the number per minute. Report any unusual observations immediately.

5–45. Blood Pressure Measurements

Blood pressure is measured by means of a sphygmomanometer (an air-pressure device) and a stethoscope (a listening device). The cuff of the manometer contains a rubber bladder. When this cuff is wrapped around the upper arm and inflated with air, the air pressure registers on the manometer gage, which is calibrated in millimeters of mercury. Taking a blood pressure requires much practice—the individual must apply the cuff properly, manipulate the air bulb, and simultaneously listen through the stethoscope and watch the gage. Any talking or other distraction while doing this decreases the chances of an accurate measurement.

EQUIPMENT

Stethoscope
Sphygmomanometer
Container of 2- x 2-inch gauze in 70-percent alcohol
Worksheet and pencil

PROCEDURE

1. Check manometer. The cuff must be completely deflated and the gage must register zero before starting.
2. With an alcohol sponge, wipe the bell (or diaphragm) and ear pieces of the stethoscope firmly.
3. Place the patient in a relaxed and comfortable position, in bed or seated next to a table. Support the arm to be used at the level of the patient's heart.
4. Expose the patient's upper arm. Remove garment if sleeve is tight.
5. Place the wide portion of the cuff against the inner surface of the upper arm; wrap cuff firmly and smoothly, tucking in narrow end to secure it. (A snap-fastened cuff or a self-adherent (velcran closure) cuff may be available.)
6. Clip gage of aneroid-type manometer to cuff.
7. Place mercury manometer on firm, level, adjacent surface, outside patient's field of vision.

8. Locate pulse of brachial artery by feeling in the bend of the elbow with the fingertips. Place the bell or diaphragm of the stethoscope over the pulse point. (Be sure the earpieces face forward when placing in ears.)
9. Tighten thumbscrew of air bulb with one hand while holding stethoscope in place with the other. Inflate cuff by pumping bulb. Listen. Look. Inflate cuff about 20 mm. above where pulse sounds were last heard. It is at this point that the air pressure has caused the artery wall to collapse.
10. Loosen thumbscrew of the bulb and allow the air to escape slowly. At the same time, watch the gage. When the first distinct sound is heard, note the number on the gage; this is the systolic pressure.
11. Continue to release the air slowly. Look. Listen. Note the number on the gage at which the last distinct sound is heard. This is the diastolic pressure.

CAUTION

In some patients, sounds may be heard to extremely low levels—all the way to the bottom of the gage. In such patients, note the levels on the gage at which the sound changes from a distinct tone to a dull, muffled beat. The diastolic pressure is recorded at the level at which the sound changes.

12. Open the valve completely, releasing all air. If any doubt exists as to the reading, repeat step 9 through this step to recheck. If doubt still exists, request another competent person to recheck the BP. Never hesitate to request this recheck.
13. Record reading on worksheet.
14. Remove cuff from patient's arm. Roll cuff from narrow to wide portion before placing in case. Before closing the case, be sure tubing is not pinched or kinked.
15. Rearrange patient's clothing.
16. Wipe earpieces, including the lumen, and bell (or diaphragm) of stethoscope with an alcohol sponge before returning equipment to storage area. (This area may be the thermometer cart.)

5-46. Assisting With the Admission Physical Examination

a. General. A physical examination is done by the medical officer on the day or evening of the patient's admission to the hospital. The enlisted specialist assisting with this procedure aids the medical officer and also obtains firsthand information concerning the patient's condition, which may be used in planning necessary nursing care. The examination may be conducted at the patient's bedside or in the ward treatment room. When a female patient is being examined, a female nursing assistant is expected to be present in the room at all times. If a male is being examined, a female assistant leaves the room during the examination of his genitalia.

b. Methods Used in Physical Examination. The following terms describe general methods of examining patients:

(1) *Inspection.* Visible observation of the patient's expression, skin condition, gait, body structure, presence of scars, or swellings. Internal surfaces of body openings are observed through instruments such as a speculum or a scope.

(2) *Palpation.* The use of touch and feeling. Changes in normal contours and detection of masses and enlarged organs not obvious by inspection are noted.

(3) *Auscultation.* Listening for sounds that indicate changes from normal. Areas of sound production in the body include the heart, blood vessels, lungs, gastrointestinal tract, and joints. The doctor may use his ear or his ear with the aid of the stethoscope.

(4) *Percussion.* Tapping on body surfaces. This combines auscultation and palpation; differentiation of hollow or air-containing structures from solid or fluid-containing structures is made through percussion. A percussion hammer is used to test neurologic reflexes.

(5) *Measurements.* Height, weight, size of organs and body dimensions, temperature, pulse, respiration, and blood pressure are measurements included in a physical examination.

EQUIPMENT

Examination tray, containing—
- Stethoscope
- Ophthalmoscope-otoscope set
- Flashlight
- Tongue depressors
- Percussion hammer
- Tape measure
- Skin pencil
- Rubber gloves
- Lubricant

Emesis basin
Paper bag
Floor lamp
Basin stand for handwashing (unless sink is available)
Paper tissues
Paper towels
Sheet
Hand towel
Scale
Additional articles such as nasal speculum, vaginal speculum, and anoscope p.r.n.

PROCEDURE

1. Tell patient what is to be done and how he may help. Have him void.
2. Escort him to the examining room, or screen him if he is to be examined in the general ward area. Reassure him with simple explanations of any equipment to be used.
3. Take and record weight and height if this has not been done on admission.
4. Place patient in the position requested by the medical officer—seated or lying flat. Cover patient with a sheet if lying down.
5. Expose various parts of the body as the examination progresses, draping with the sheet and towel to avoid unnecessary exposure of the breast or pubic area. The usual order is chest, abdomen, extremities, genitalia, and rectum.

NOTE

Remember to hand patient tissues and remind him to turn his head away from the doctor when he is requested to cough during the chest examination.

6. Assist patient to dress and make him comfortable after the examination.
7. Tell patient the doctor will discuss and explain any findings of the examination.
8. Clean and reset examination tray.

VAGINAL (PELVIC) EXAMINATION

A calm, matter-of-fact attitude will reassure the patient and help her relax.

EQUIPMENT

Vaginal speculae, different sizes
Lubricant
Clean gloves
Basin of detergent solution
Stool (for doctor to sit on)

PROCEDURE

1. Position the patient in dorsal recumbent or lithotomy (feet in stirrups).

NOTE

In lithotomy position, the buttocks must be even with the break in the table.

Drape her with a sheet while assisting her into position. Use the sheet as a diamond (fig. 5–32), one corner over chest, one corner wrapped around and tucked under each leg, and the fourth corner over pubic area, to be folded back when the medical officer is ready to do the examination.

2. Adjust the light. Adjust the drape.
3. Have lubricant ready to apply to the speculum and to the medical officer's gloved fingers.
4. Stand by the patient's side while the examination is done instead of attempting to look over the doctor's shoulder.
5. After examination, assist the patient to wipe off lubricant with tissues. Help her into a comfortable position and to arrange her clothing.

5–47. Intake and Output Observations and Recordings

a. Importance of Observations. Observations concerning a patient's intake and output provide

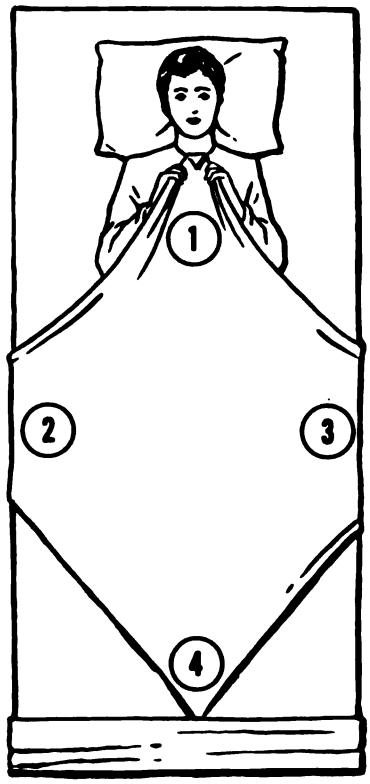


Figure 5–32. Drape sheet, female pelvic examination.

the medical officer with essential information concerning the patient's fluid balance. This information is considered a vital sign; for many patients it may be a more important clue to progress than TPR and BP, the vital signs more commonly and routinely observed, measured, and recorded. The medical specialist often assists in keeping an intake and output record when one is ordered for specific patients. However, whether or not a specific order is written, the medical specialist should be aware of observations to be made on a 24-hour basis as a part of overall nursing responsibility in patient care. He should be able to supply answers to the following questions that may be asked by the medical officer or by the nursing team leader:

(1) Has the patient eaten the food and fluids provided on his diet tray? If he has not, how long has he failed to do so?

(2) Has the patient drunk water provided at his bedside? If not, how long has he failed to do so? Has fresh water been provided at regular intervals for all patients permitted oral intake?

(3) Does the patient increase his oral intake of food and water when assistance and encouragement are provided by nursing personnel?

(4) Has the patient urinated during the medical specialist's 8-hour tour of duty? (The average healthy adult voids between 100 to 300 ml. five or more times during waking hours, for a total of 1000 to 1500 ml. of urine in 24 hours. Urine volume is dependent upon many factors, with the amount of fluid intake a major one: a large intake usually results in a large urinary output, a small intake in a small output.)

b. Indications for Intake and Output Recording. The medical specialist should anticipate that the medical officer will want intake and output measurement and recording (1) for any patient unable to take adequate oral food and fluid for any reason and (2) for any patient with abnormal fluid losses; *for example,* diarrhea, vomiting, fever, or excessive perspiration. When in doubt whether to start recording intake and output without an order, start recording as an automatic nursing measure that contributes to the patient's welfare. If the medical officer indicates that an I & O record is not required, the patient will have benefitted from having nursing personnel aware of important basic needs.

c. Intake and Output Records.

(1) *DD Form 792 (Nursing Service—Twenty-Four Hour Patient Intake and Output Worksheet (I & O Worksheet)).* This form is kept at the patient's bedside. It provides spaces in which to record the time, the type, the description, and the amount (in ml.) of fluid intake and output.

(*a*) *Intake.* Intake consists of all liquid taken into the body of the patient. Intake may be oral, intravenous, or rectal, or it may be by hypodermoclysis or gavage. Fluid obtained by any of these means must be taken into account, measured as accurately as possible, and recorded.

(*b*) *Output.* Output consists of all liquid released by the body of the patient. Output is by means of voiding, vomiting, drainage, catheterization, perspiration, and defecation. Urine must be measured each time the patient urinates or is catheterized, drainage and vomitus must be measured as accurately as possible, and a notation must be made of amount of feces and whether soft or hard.

(2) *Transcribing entries from the I & O Worksheet.* Entries on the I & O worksheet are the responsibility of the individual to whom the patient is assigned for nursing care. It is customary for the night nurse to total the entries on the worksheet and transcribe the totals to the patient's clinical record. The worksheet is usually picked up from the bedside at 2400 hours, and a new form is started for the next 24 hours. After the totals are transcribed to either SF 511 or to DD Form 640, the worksheet may be destroyed or it may be kept temporarily in the nurses' station for reference.

d. Suggestions for Achieving Accurate I & O Records. Entries concerning intake and output are often the first nursing notations reviewed by the medical officer and, unfortunately, he may often have reason to complain that the information is incomplete or questionable. Persistent effort, constant supervision, and continuous attention of all nursing team members must be directed to making this record accurate and therefore usable. Personnel should accomplish the following:

(1) Attach a "Measure Intake-Output" sign to the head of the patient's bed or as determined by local policy.

(2) Keep the bedside worksheet in a prominent place at the bedside as local policy dictates, preferably on a clip board with attached pencil or ballpoint pen.

(3) List all patients requiring I & O, and post this list in appropriate work areas—for example, post a list in the Kardex and post a second list for

"Output" directly above the bedpan-urinal washer in the utility room. Remind personnel to check the list at frequent and regular intervals and to keep the list up to date.

(4) Instruct the patient so that he will know what is expected of him.

(*a*) *Intake.* Tell him what restrictions or what requirements for increasing intake have been ordered. Whenever possible, space the intake hourly, making allowance for evening and night ingestion of fluids. Ask him what he drank when checking bedside containers or meal trays—do not assume because the container is empty that he was the one who drank the contents.

(*b*) *Output.* Request the ambulatory patient to use a urinal or bedpan and to notify nursing personnel so that contents can be measured and recorded.

(*c*) *Record keeping.* If the patient is permitted to keep his own record, check the entries made.

(5) Use calibrated measuring equipment for measuring output when it is available—do not guess. When a wide-mouthed glass or plastic graduate is not available, use a calibrated, 1000-mm., empty IV bottle, with an improvised paper funnel, for measuring urine. A gallon-size drainage bottle can be marked with an adhesive strip to indicate the 50 or 100 ml. level.

(6) Know the amounts customarily contained in drinking utensils. A cup or glass may have a capacity that differs from the usual serving level, and everyone using the utensil should be in agreement. Intake equivalents for serving levels in china and glass hospital utensils are listed on the I & O worksheet. (Plastic utensils in field equipment have different capacities; *for example,* the plastic cup and the tumbler have a 10-ounce (300 ml.) capacity; a metal canteen cup has approximately 500 ml. capacity.)

(7) Use agreed-upon descriptive terms in reporting and recording output that must be estimated. Thus, for a patient who is perspiring profusely or who is incontinent of urine, the output may be recorded in terms of the dampness of his bed clothing—"bed clothing damp," or "bed clothing saturated."

(8) Record all measurements, estimates, and observations at the time they are made. Do not wait; you could forget to make the entry.

(9) When assisting with intravenous fluids, gavage feedings, tube or catheter irrigations, emptying and measuring drainage bottles, know exactly what entries are to be made. (Follow instructions of the doctor or nurse.)

Section VI. THERAPEUTIC PROCEDURES—GENERAL

5-48. Sterile Technique and the Use of Sterile Supplies

a. General. Sterile technique is a method of handling sterile materials so as to maintain their sterility. The purpose of sterile technique is to prevent contamination and thus to promote asepsis, freedom from infection. Sterile technique is indicated in any procedure involving contact with an open wound, puncturing of skin or mucous membrane, or entrance into a normally sterile body cavity. The terms "sterile technique" and "surgical aseptic technique" are often used interchangeably. However, surgical aseptic technique is commonly accepted as including all of the steps performed in the sterilization of articles as well as the measures used to prevent contamination of sterile materials. (For detailed information on sterilization, including methods and equipment, refer to TM 8-275. For detailed information on surgical aseptic technique with specific reference to operating room procedures, refer to TM 8-220.) In the rigidly controlled environment of the operating room sterile technique can be practiced in its most exacting sense, but the principles of asepsis on which sterile technique is based also have practical application in ward and clinic areas. Familiarity with certain basic principles is essential for any procedure requiring the use of sterile materials. Three key principles are—

- An article is either sterile or unsterile. If there is any doubt about its sterility, consider the article unsterile.
- Contact with an unsterile surface contaminates a sterile object.
- Air currents are capable of carrying contaminants.

b. Basic Steps in Sterile Technique.

(1) Set up for, assist with, and perform sterile procedures in as clean an environment as possible. Contribute to favorable environmental aspects by practicing good personal hygiene habits

and observing established procedures in all hospital housekeeping duties, particularly in discarding waste and in maintaining a dust-free work area.

(2) Wash hands thoroughly before beginning any sterile procedure in order to rinse off surface bacteria and to make hands as clean as possible. (Paragraph 6-33 covers surgical hand scrub and gloving procedure.)

(3) Use only sterile supplies. Supplies must have been sterilized by the best available method, stored, and handled properly to avoid contamination.

(4) Keep equipment sterile during preparation for and while performing the procedure. Maintain sterility of articles in use by handling them with sterile instruments or sterile gloves, and by exposing them to room air for the least possible time.

(5) Discard any object which becomes contaminated. A sterile object that touches anything not sterile is considered contaminated.

c. Routine Ward and Clinic Activities Involving Application of Principles of Sterile Technique. The medical specialist must demonstrate his understanding of basic principles of sterile technique by adhering to these principles every time he performs, or assists with the performance of, any of the following routine ward activities:

- Using sterile transfer forceps.
- Opening a sterile package.
- Removing sterile articles from a sterile container.
- Pouring a sterile solution.
- Storing sterile supplies.
- Setting up a sterile field.

d. Use of Sterile Transfer (Pickup) Forceps.

(1) While in use, allow sterile portion to touch only sterile articles.

(2) When not in use, keep transfer forceps in a forceps jar which is filled with a prescribed germicide solution to above the hinge of the forceps and within 1 inch of the top of the container. The part of the inner surface of the container and the part of the forceps immersed below the level of the solution are sterile. The container surface above the solution, the rim, and the forceps above the solution are not sterile.

(3) Remove transfer forceps from and replace in the container in a straight line (fig. 5-33) so that a sterile surface never touches an unsterile surface. Replace forceps in container with hinge unclamped to permit solution to cover entire hinge area.

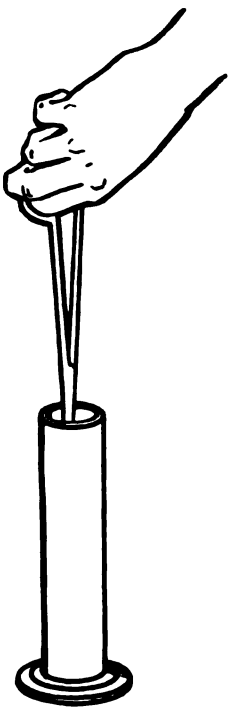


Figure 5-33. Removing transfer forceps from container.

(4) During use, keep forceps tips pointed downward, above working level. If forceps are held with tips upward, the solution will run over the unsterile part, and then when the forceps are reversed the contaminated solution will run back, contaminating the sterile portion.

(5) Replace container and forceps daily with sterile ones obtained from CMS. If contaminated in use, replace them at once.

NOTE

The germicide solution is intended to preserve sterility; the articles themselves must be sterilized by autoclave.

e. Handling Sterile Supplies.

(1) *Sterile packages.* The inside of the wrapper and the contents of package are sterile; the outside is unsterile. When opening the package, touch only the outside surface. Hold the wrapped package away from the body or stand away from it to avoid body contact. Follow printed instructions on commercially prepared sterile items; if item is processed in a "peel-down flap" package, manipulate the flap according to the manufacturer's illustration. Follow steps illustrated in figure

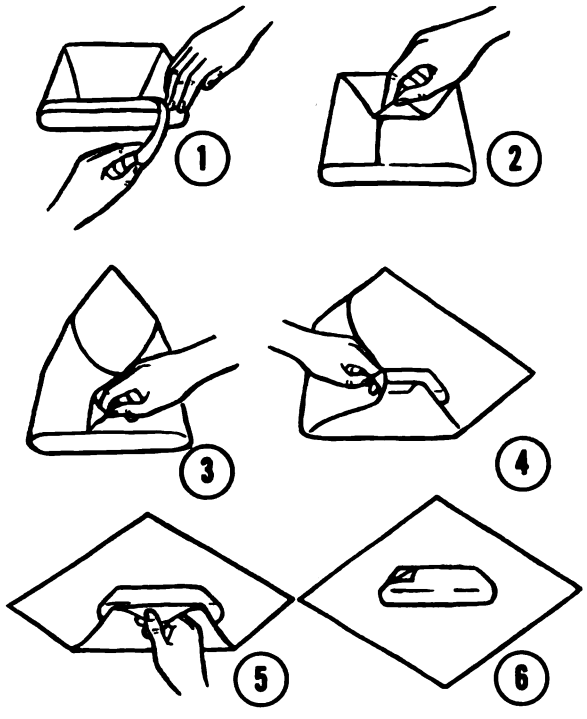


Figure 5–34. Technique for opening a sterile package.

5–34 for opening wrapped packages as they are usually prepared in a hospital CMS.

(*a*) Place large wrapped items on a dry flat surface; hold small items on the palm of one hand.

(*b*) Place unopened package so that the tip of the top flap is toward the body. Remove string or tape.

NOTE

Heat-sensitive tape used at the external opening of packaged material will show distinctive diagonal stripes following exposure to a heat-sterilization process.

(*c*) Open wrapper by pinching up top surface of each flap in sequence. Avoid reaching across inside of wrapper; change hands as necessary. The last flap opened is the one toward the body.

(*d*) To hand contents of a small package to a gloved individual, grasp loose ends of the wrapper and hold the package above waist level, away from the body (fig. 5–35).

(2) *Removing sterile articles from sterile container.*

(*a*) Lift lid or cap straight up. Hold lid with inner surface down; if lid must be rested momentarily on a work surface, place lid with inner surface up. Remove the lid only when necessary, and replace it as soon as possible.

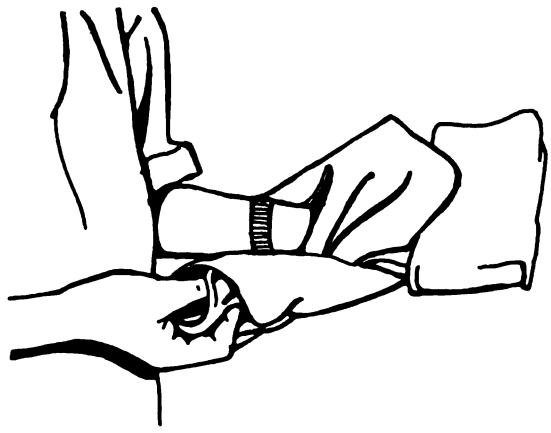


Figure 5–35. Handling sterile articles.

(*b*) Use transfer forceps to remove contents from container.

(*c*) Remove articles from container by lifting straight up and out. Do not touch rim of container with transfer forceps or with contents removed from the container.

NOTE

Individually packaged articles are used in preference to canister or other container storage of sterile items because each time a container is opened, the contents are exposed to possible contamination.

Never return an article to a sterile container once it has been removed. When the container is accidentally contaminated, remove the container at once. If removal is not possible, invert the cover on the container to indicate that it has been contaminated and must be resterilized before it can be used.

(3) *Sterile solution flasks.* A flask containing a sterile solution for external use which is prepared in CMS is vacuum-sealed with a cap which completely covers the pouring lip. Once the cap seal is broken by loosening or removing it, sterility of the contents is no longer assured. Always check the cap for an intact seal before use. If the cap is a flexible, disposable type, look for a distinct depression in the dome. If the cap is a rigid, plastic, reusable type, test the seal in this fashion: pick up the flask by the neck and with the free hand, strike the top of the cap with the heel of the hand; if the seal is intact there will be a distinctive click sound. To pour solution—

(*a*) Remove cap by lifting it straight up.

(*b*) Hold the flask just high enough above the receptacle to avoid touching and to prevent splashing.

(*c*) Do not return an opened and subsequently recapped flask to a sterile supply storage area. It may be retained for use at the bedside of the patient unless otherwise directed.

f. Storing Sterile Supplies. Sterile supplies wrapped in a double thickness muslin wrapper, paper or cellophane tubing stored in a dry clean, vermin- and insect-free area are considered to have a "shelf storage life" of at least 30 days from the date of processing (sterilization). Sterile supplies placed in a plastic cover after sterilization but not hermetically sealed are considered sterile for 30 days. Infrequently used sterile supplies which are hermetically sealed in plastic covers after sterilization are considered sterile for 6 months from date of processing (sterilization).

(1) Store sterile supplies on dry, clean, dust free shelves above floor level. When possible, use a closed cabinet for storage in preference to open shelves.

(2) Check dates stamped on supplies (which would be the date the package is no longer considered sterile) and rotate on the shelf to use older dates first. Return outdated materials to CMS for reprocessing.

(3) Do not use packaged materials if there is any apparent damage to the wrapper, any moisture stains, or any broken seals. Commercially prepared sterile materials usually state on the package label words to this effect—"Sterility guaranteed unless package is opened, damaged, or wet."

g. Setting up a Sterile Field. The sterile field is the dry, sterile surface area on which sterile articles may be placed for convenience in use during a sterile treatment procedure. In a ward or dispensary treatment area, a practical and safe way to set up a sterile field is as follows:

- Plan to use only the interior surface of the outer wrapper of a sterile package or preassembled, wrapped sterile tray. These items are wrapped and processed to allow this use, providing that they are opened properly (fig. 5–34).
- Place the wrapped item on a clean dry, flat surface at the place of use. It is hazardous to open the package in a separate preparation area and then to attempt to re-cover or close the wrapper for transportation to the place of use.
- Open the outer wrapper, as directed, just before use to reduce exposure and possible contamination factors.
- Handle interior contents with sterile transfer forceps or sterile gloved hands. If the user will have to pick up an instrument from the sterile field with his ungloved hand, make it possible for him to do so by using this accepted technique: Consider an approximately 1½-inch border at the outer margin of the sterile field as a boundary area. With the transfer forceps, pick up the required instrument and place the handle within this border. Once touched by the ungloved hand of the user, the instrument may not be replaced within the sterile field.
- Never place moist items on any fabric portion of the sterile field as moisture carries microorganisms from the unsterile undersurface to the sterile upper surface. If a germicide-moistened item must be used, drop this item into a solution cup or glass on the tray. Avoid splashing solution when pouring it into any container.
- Do not reach over the sterile field when placing additional items on it. Move around the table on which the sterile field has been set up, and drop the article onto the surface, avoiding any contact.

5–49. Use of the Surgical Dressing Cart (fig. 5–36)

The traditional dressing cart, once kept ready and available for use as a mobile supply station for surgical dressing materials, is now seen less frequently on hospital wards. In many instances the need for its use has been eliminated. Current emphasis in dressing technique is directed to changing the dressing according to need rather than on routine dressing rounds, and individual packaging of sterile supplies is preferred to use of stock supplies from a common-use container or canister. When a dressing cart is used to meet the needs of a treatment unit, principles of asepsis must be followed. Properly used, the cart can be a convenience in transporting materials from a central ward storage area; improperly used, the cart and its contents become contaminated and therefore a means of spreading infection.

Precautions in Use of The Dressing Cart

- Never place soiled instruments, utensils, dressings, wrappers, linen, or waste materials of any kind on the cart.

Figure 5-36. Surgical dressing cart.

- Do NOT place receptacles (basin, bucket, or bags) in the ring supports at the end of the cart. This practice was once accepted as a convenience for collecting used materials in a clean-up procedure after applying a dressing but it is now universally recognized as a violation of aseptic principles.
- Never place the cart in proximity to the bed unit of a patient with an infected wound, or allow the cart to come in contact with any bed unit.
- Do not use the cart as a catch-all for miscellaneous items. When used, stock it in accordance with a supply list, placing specific items in designated locations. *For example,* place packaged sterile supplies on the top shelf and on one section of the lower shelf; place clean supplies in a separate section of the lower shelf.
- Do not place excessive quantities of any item on the cart. For safety, unused items once they have been taken into a direct patient care area should not be returned to a clean storage area for subsequent use.

5-50. Dry, Sterile, Wound Dressing

A dry, sterile, wound dressing (DSD) applied to a wound at the time of initial surgical treatment should not be disturbed or removed except as directed by a medical officer. Nursing personnel are responsible for observing and reporting the condition of the dressing, and should note particularly any evidence of displacement and the character and amount of visible drainage. Reinforcement by placement of additional tape or supporting bandage is usually permissible; however, if the dressing has been displaced from the wound itself, it should never be adjusted by sliding it back in place—this would contaminate the wound. If there is evidence of displacement, permission must be obtained to remove the displaced portion and to apply a fresh, sterile dressing. It is customary for the medical officer to do all initial dressing changes himself; he may then decide to discontinue the dressing, or he may delegate responsibility for subsequent dressing changes to a qualified assistant. If you, the medical specialist, are assigned this responsibility, you must observe the following precautions under all conditions:

- Know the nature of the wound and the kind and amount of dressing materials required for its protection and treatment. This information is best obtained first-hand, while assisting the medical officer and observing under his direction the condition of the wound and the manner in which it must be handled.
- Use aseptic technique (paras 5–48 and 5–49).
- Avoid any damage to body tissues. Know exactly what part of the wound may be touched and in what manner. Be gentle and cautious in removing and replacing dressing materials to avoid pain and damage to healing tender tissue.

DRESSING PROCEDURE

Unless otherwise directed, use the procedures outlined below as a guide in changing and applying wound dressing. Plan to dress first a wound or wounds designated by the medical officer as "clean" before dressing wounds designated by the medical officer as "infected" or as "dirty"; this measure helps reduce the concentration of known airborne contaminants to which a clean wound is exposed during the dressing change. Follow local instructions for wearing a mask when dressing wounds; whether masks are worn or not, always remember to restrict all unnecessary talking and traffic in and around the area in which wounds are being dressed.

Preparation

1. Wash hands.
2. Assemble dressing materials. Items required will vary, depending upon the medical officer's instructions and the supplies available. When several items will be needed, avoid last minute delay and inconvenience by making a list, assembling all items on a tray or mobile table, and then taking the tray or table to the location of use. Basic equipment for applying a DSD to a surgical wound will usually include the following items:

Dressing set, individually wrapped
Gauze dressings, individually wrapped
Skin antiseptic, as prescribed*
Transfer forceps
Bandage scissors
Adhesive tape
Emesis basin
Paper bag, paper towels, or newspaper
Gloves, plastic, disposable
Tray, instrument

* Used foil-wrapped germicide wipes; if these are not available, use stock bottle of prescribed solution and sterile 2-inch by 2-inch gauze or sterile cotton-tipped applicators.

3. Prepare the patient and the unit. Tell the patient what is to be done. Clear the bedside stand to provide a work area. Screen the bed if on an open ward. Place the patient in a comfortable position that will also permit complete exposure of the area to be dressed; adjust pajamas and bed clothing to expose the dressing. If the patient is ambulatory and the dressing is to be done in the ward treatment room, help the patient into the required position, using the examining table or seating him in a chair; assist him to adjust his clothing to expose area to be dressed.
4. Wash hands.
5. Take dressing items, assembled on the clean tray, to prepared dressing area. Place tray on table, convenient to use.

Procedure When Removing and Reapplying Dressing

1. Place emesis basin and paper for waste at foot of bed or otherwise away from sterile work area.
2. With bandage scissors, cut required strips of adhesive and stick one end of each strip at table edge, handy for use.

NOTE

Use bandage scissors only for clean materials. If used to cut off bandages on a patient they are then contaminated and must be sterilized before reuse.

3. If stock bottle of solution is to be used, loosen cap but do not remove; this preliminary step will permit manipulating the solution container with one hand during actual use.
4. Open sterile wrappings, using transfer forceps p.r.n. to arrange materials convenient for use. Do not contaminate any sterile article; if accidental contamination occurs at any time, discard and replace the contaminated item. Use inside of sterile dressing-set wrapper for a sterile field—the minimum size of this double-muslin, or moisture impervious paper wrapper, is 12 inches square and will usually be adequate in size. Move instruments to be picked up by ungloved hand so that handles lie at edge of the 1½-inch boundary of the sterile field.
5. When all is in readiness to proceed with the dressing, remove outer dressing:

- Use plastic disposable gloves, when available, to protect clean hands while handling soiled outer dressing. If bare hands must be used, cleanse

hands immediately afterward by washing or by thorough friction-wiping with germicide-moistened gauze or commercially prepared wipe.

- Discard outer dressing and plastic gloves, when used, in paper bag or on newspaper.
- In removing adhesive tape avoid all tension on wound edges by loosening ends while holding skin taut, then pull each end toward the wound. Remove tape marks from patient by using acetone or ether.

6. Using sterile hemostat or thumb forceps, remove inner dressing. Note amount and character of drainage, if any. Discard dressing on paper; discard forceps in basin.

- To loosen a stuck dressing, moisten the dressing with a small amount of the sterile solution ordered by the medical officer. Use a sterile asepto syringe and solution basin. As the dried secretions become soft, gently lift off the dressing with forceps.

NOTE

There is always danger of introducing microorganisms into the wound when moisture is applied to the surface of the dressing, so when drainage is anticipated, a dry, sterile strip of a special porous but nonadherent material is often placed in contact with the wound surface; this material can be peeled off gently with no damage to underlying tissue.

7. Observe condition of wound and surrounding skin area, noting particularly any swelling, redness, or excessive tenderness.
8. Cleanse wound edges as directed by the medical officer, using moistened gauze, applicator sticks, or foil-wrapped wipes. Work outward from wound margins in cleansing; do not retrace; rotate to clean surface and replace item as it becomes soiled with exudate.

- If foil-wrapped wipes are to be used, open peel-down flaps and remove contents with sterile forceps, grasping contents so that they may be used without further handling.
- If applicator sticks are to be used, hold each over basin while pouring on solution.
- If 2 by 2 gauze squares are to be used, pick each up with forceps, folding edges in to grasping surface of forceps to make a sponge; hold over basin while pouring solution.
- To apply protective ointment or petrolatum gauze to skin edges, do not apply ointment or petrolatum gauze on the wound itself unless specifically ordered, as the greasy base will seal in drainage. After cleansing the wound and skin edges, dry the skin by blotting gently with dry sterile gauze. Use a sterile tongue blade to apply ointment. Use sterile scissors to cut petrolatum gauze to required size.

9. Apply inner dressing, using second forceps. Never drag dressing across skin adjacent to wound but pick up dressing and lay directly on wound. Reinforce inner dressing as required with additional dressings so that dressing extends at least 2 inches beyond wound edges on all sides. If much drainage is anticipated, cover inner dressing with gauze fluffed with forceps, and cover fluffs with ABD pad or other outer protective layer of dressing. The outer moisture-resistant surface of an ABD pad is marked with a stripe or indicated by a darker color filler layer; place the inner absorbent surface next to the inner dressing.
10. Secure dressing in place with adhesive tape or other external wrapping.
11. Wrap discarded dressings securely in paper, touching only outer surface of paper.
12. Make patient comfortable, adjusting clothing and position as necessary.
13. Remove all dressing equipment from bedside table. Discard wrapped dressing in covered container in utility room. NEVER discard soiled dressings in wastebasket, wastepaper bag, or other container in the patient care area. Discard cloth wrappers in laundry hamper. Follow local procedure for handling contaminated instruments and utensils (basins, solution cups, etc.). If items are to be prerinsed, avoid all splashing and contamination of clothing and work area. Place items to be returned to CMS at collection point.
14. Wash hands.
15. Record dressing change in Nursing Notes: time, condition of wound, cleansing solution used, and signature.

5-51. Methods of Holding Dressings in Place

Dressings are held in place by a variety of materials—adhesives, binders, bandages, or combinations of all three. The choice of item depends on the type and purpose of the dressing, the area of the body on which the dressing is placed, and the availability of supplies. Whatever means is used, it must be applied so that:

- The dressing will be held securely in place.
- Underlying tissues will not be damaged.
- The affected part will be protected and supported as necessary.
- The finished dressing will be comfortable and neat.

a. Use of Adhesive. Do not apply adhesive, tape or liquid, to abraded or inflamed skin.

(1) Prepare adhesive tape strips that will be long enough and wide enough to hold the dressing in place. Fasten one end of the tape at far side of dressing, pull snugly over dressing and fasten on near side. If dressing is to be occlusive (completely sealed), apply center strip first, then apply alternate overlapping strips.

(2) When liquid adhesive is used, apply sparingly to clean, dry skin at underlying edges of dressing; then seal dressing edges with firm, outward finger pressure. Any residue of liquid adhesive that oozes out from edge of dressing can be rubbed off, when dry, with the fingertips.

(3) When available, use elastic-woven tape to secure dressings at joints and deeply contoured body areas.

(4) Use tape tie-straps (Montgomery straps) in appropriate areas when dressings must be changed frequently; their use eliminates the need of pulling off tape with attendant skin irritation at each change of dressing. Montgomery straps are suitable for use in chest and abdominal areas to support large, bulky dressings without compression. When compression is needed, binders, bandage, or tape strips are required.

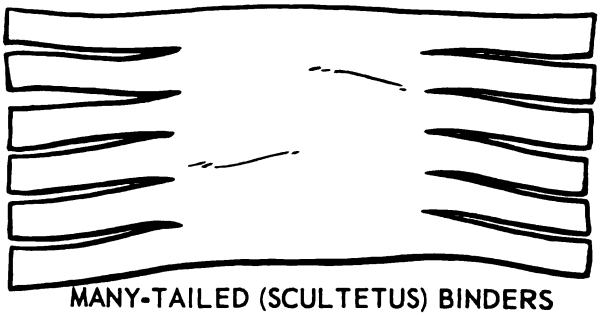
NOTE

Commercially made Montgomery straps may be available through CMS.

- *To make Montgomery straps.* Use 1-inch or 2-inch tape, the width depending on body contours. Cut tape in about 9-inch lengths, to make pairs. Lay each strip, fabric side down, on a flat surface; place an applicator stick on adhesive surface about 2 inches from end and fold tape back over the stick, alining tape edges. With bandage scissors, cut off protruding sticks, leaving short smooth projections on which rubber bands can be looped. If bandage strips are to be used for lacing, cut a small hole about 1 inch from the folded edge.
- *To apply Montgomery straps.* Apply in opposite pairs, using care in their placement if they are to serve their purpose. Select intact, healthy skin for tape anchorage. First, place the nonadhesive portion to overlap the edge of the dressing, then fasten the adhesive portion to the skin, avoiding any wrinkling of skin or tape. Connect pairs with loops of rubber bands or bandage strips laced through the holes; if bandage is used, tie in bows for ease in removal. Remove straps when soiled, selecting alternate skin areas for reapplication of clean tape.

b. Use of Binders. A scultetus (many-tailed) binder is used in abdominal areas; a T-binder or double T-binder for perineal or rectal dressings. When applying any binder, be sure it is smooth and free of wrinkles; secure free ends with safety pins, avoiding placement of pins over bony prominences or any area that may cause pressure. For ease in insertion of pins through cloth, stick the pinpoint first into a cake of soap; then insert at right angles to the pull of the material to maintain tautness. Obtain clean binders from CMS; send soiled binders to the laundry, enclosing them in a laundry net (mesh bag) for ease in handling by laundry personnel.

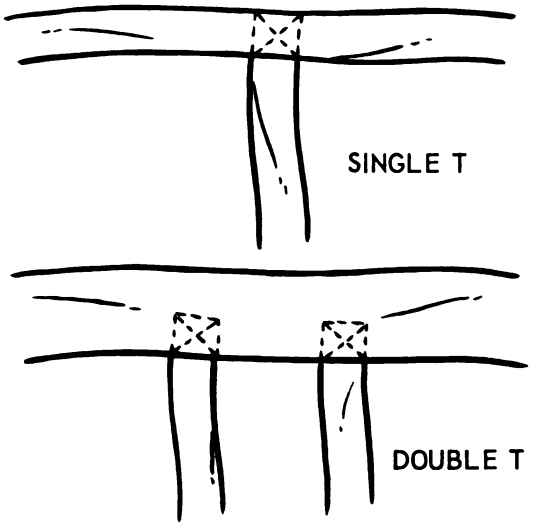
(1) *Scultetus binder.* Place the patient flat, in supine position. Smooth out wrinkles in the binder with hand pressure, and place under the patient so that it extends from buttocks to flank area. Start at lowest tail, bring over smoothly, and lap opposite tails in succession, slanting each one in a slight diagonal direction from bottom to top. Fasten the last tail with one safety pin, slipping a finger under the binder to avoid sticking the patient. The completed binder should give the patient a sense of firm, comfortable support without constriction, and with no impediment in taking a deep breath. If the binder is uncomfortable, wrinkled, or damp, remove and replace it with a clean, dry one. Unless otherwise directed, remove the binder when giving back care.



Many-tailed (scultetus) binders.

(2) *T-binders.* Use the single T-binder for women, the double T-binder for men. When

applying, have the patient in dorsal recumbent position. First, place and pin snugly the waist band at the front, overlapping any excess material; then bring the free end from back to front, slipping the end under the secured waist band and pinning to hold the dressings securely in place. When adjusting the double T-binder on the male patient, be sure each strip is brought around to either side of the scrotum—check to make sure.



NOTE

The double T-binder may be used for scrotal elevation, as in figure 5–37. When used in this manner, a firmly rolled hand towel or large ABD pad is first placed to elevate and support the scrotum; pressure from the binder is directed against the pad, not the scrotum. Alternative mean of scrotal support is by an adhesive tape device, called a "Bellevue bridge." When a patient has required this type of support as a bed patient, he must usually be supplied with a scrotal suspensory (not illustrated) when he is allowed out of bed and ambulating.

c. Use of Bandage. Roller bandage is commonly used to hold a dressing in place over damaged or tender skin, particularly when a combination of protection, compression, support, and limitation or restriction of movement is required. The properly applied bandage is not so tight that it restricts circulation or so loose that it allows the dressing to slip. The traditional gauze roller bandage is the most time consuming and difficult to apply satisfactorily when a firm, secure, evenly

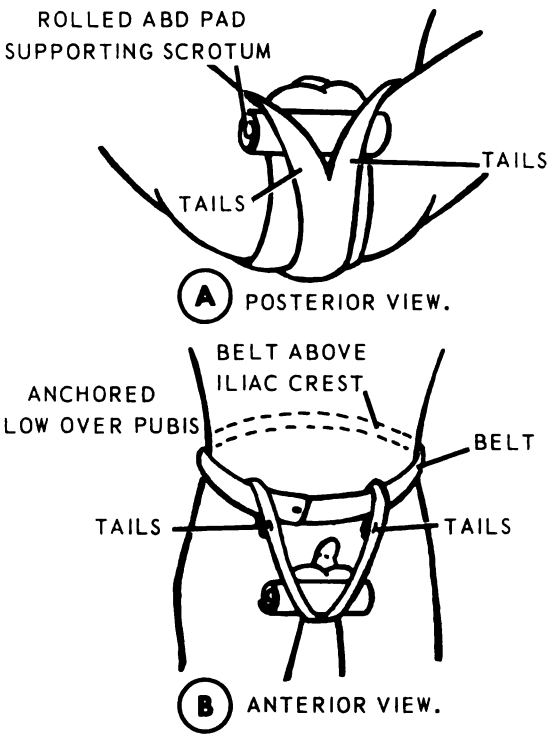
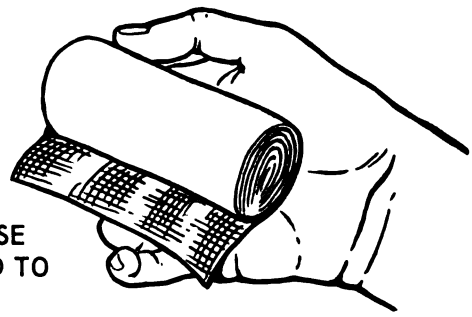


Figure 5–37. Methods of providing scrotal support.

applied compression bandage is required; for economy, use this readily available item for occasions when a relatively loosely applied, temporary bandage is required and reserve for more exacting use the more costly stretchable bandages, such as self-adherent gauze elastic bandage. Select the width suitable for the part to be bandaged; useful widths are 2-inch for hand, fingers and toes; 3-inch for arm, leg, or head; and 4-inch (or 6-inch, when available) for thigh or trunk.

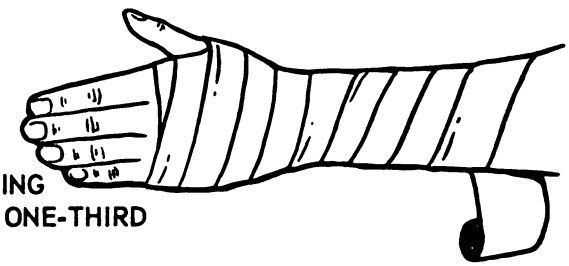
NOTE

Gauze elastic bandage is a type of disposable bandage for use over wound dressings. Cotton elastic (commonly referred to as Ace bandage) is frequently used for compression and support purposes when an underlying dressing is not required; it is a reusable type of bandage, and with proper care its elasticity is restored when laundered and dried properly. Local policy will prescribe how used bandages are to be cared for; they are often sent to the laundry, to be handled as binders are. If they must be washed on the ward, always dry them flat (rather than hanging them up) to preserve their elasticity; when thoroughly dry, roll the clean bandage in a firm roll, with no stretching.

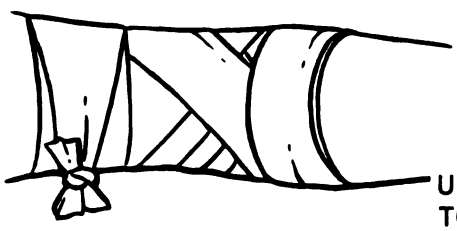


A. STARTING: HOLD ROLLER BANDAGE WITH LOOSE END ON BOTTOM, EXTERNAL SURFACE TO BE APPLIED TO PART.

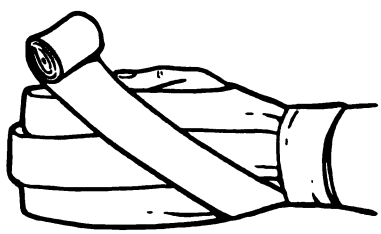
B. ANCHORING: LAY TIP OF LOOSE END ON PART; ANCHOR WITH A FEW CIRCULAR TURNS.



C. SPIRAL: ANCHOR, THEN APPLY SUCCEEDING DIAGONAL TURNS, OVERLAPPING EACH TURN BY ONE-THIRD OF THE BANDAGE.



D. FIGURE-OF-EIGHT. ANCHOR BELOW JOINT; SPIRAL UPWARD FOR CIRCULAR TURN ABOVE JOINT; SPIRAL DOWN TO FORM AN X WITH UPWARD TURN; REPEAT, OVERLAPPING EACH TURN.



E. RECURRENT: ANCHOR DISTAL TO PART TO BE COVERED; THEN FOLD BANDAGE BACK AT RIGHT ANGLE AND CARRY OVER SURFACES, REVERSING RIGHT-ANGLE TURN TO CARRY BACK TO ORIGIN; REPEAT, ALTERNATING TO LEFT AND RIGHT OF CENTER LINE; SECURE RECURRENT TURNS WITH SPIRAL TURNS.

NOTE: PADDING BETWEEN SKIN SURFACES IS NOT ILLUSTRATED.

Figure 5-38. Basic methods of applying roller bandage.

Application of Roller Bandage

Basic methods of applying roller bandage are illustrated in figure 5–38; techniques of bandaging are discussed in FM 21–11. In applying any type of roller bandage, the following general rules should be observed:

- If two parts are being bandaged together, separate skin surfaces with absorbent material to prevent irritation and pressure. Examples of such surfaces are fingers, toes, ear and scalp, arm and trunk, axilla.
- Use the least possible number of circular turns to minimize a tourniquet effect. Circular turns used for anchoring must be only tight enough to keep the bandage from slipping; spiral (diagonal) turns are less constricting.
- Control tension and pressure of the bandage with each successive turn, avoiding any excessive and uneven pressure.
- Use a large number of turns rather than a few too-firmly applied ones. Overlap each turn by about ⅓ the width of the bandage to prevent the skin from being pinched or the bandage from gapping.
- Test for tightness: you should be able to just slip your finger between bandage-turn overlaps without disturbing the bandage; if the bandage is apt to become wet, as when securing a wet dressing, apply more loosely to allow for shrinkage.
- Reapply the bandage if it is unsatisfactory in any way.

5–52. Local Applications of Heat and Cold

a. General. The applications of heat and cold discussed in this section are limited to those commonly administered by nursing personnel in the ward or clinic area. (Many other methods of applying heat or cold are administered by physical therapy personnel.) The form of application, the temperature at which it is applied, and the duration and frequency of the treatment are prescribed by the doctor. It is a nursing responsibility to apply the prescribed form of heat and cold so that the treatment is beneficial, rather than injurious to the patient. Since many of these treatments may be self-care measures for patients, nursing personnel also have a special obligation to instruct patients on the hazards as well as the benefits of hot and cold applications.

(1) There is always a problem when the treatment is ordered by descriptive adjective, since the questions of "how hot is hot?" and "how cold is cold?" must be answered. The range of temperature from cold to hot, in relation to therapeutic applications, falls within these limits: cold, 65 to 90 degrees; tepid (cool to lukewarm), 90 to 100 degrees; warm, 100 to 105 degrees; hot, 105 to 120 degrees. Added to the temperature in degrees is the moisture factor—moist heat and cold are both more penetrating and more intense in their effect on body tissue.

(2) The only sure way to test temperature is with a solution (bath) thermometer (fig. 5–39) or with a cooling or heating device which has a thermoregulator calibrated in degrees, such as the hot-cold circulating pad.

(3) The time-honored method of estimating safe limits of heat by testing against the inner surface of the forearm can be justified only when this estimation is backed up with experience and judgment. Nursing personnel must always remember that what might feel comfortably warm on normal, healthy skin could be dangerously hot if applied to the skin of infants, old people, or individuals with impaired circulation, as in peripheral-vascular disease. Use every opportunity to develop experience and judgment by first feeling and then comparing with available testing devices; there is usually a tendency to underestimate actual degrees of warmth and hotness.

b. Use of Heat and Cold. Reasons for applying heat and cold are summarized as follows:

(1) *Heat.* Since externally applied heat tends to dilate peripheral blood vessels, heat is used to increase the supply of blood to an area. Heat therefore is prescribed to relieve pain due to muscle spasm, to relieve inflammation, to promote localization of purulent material and its drainage, and to relieve chilling.

(2) *Cold.* Since externally applied cold tends to constrict peripheral blood vessels, cold is used for temporary decrease of blood supply to a local area. Cold therefore is prescribed to prevent and relieve swelling (if applied immediately after injury), to reduce the pain of inflammation, to provide temporary local anesthesia by reducing sensitivity of nerve endings in the skin, and to reduce body temperature.

5–53. Local Applications of Heat

Heat is commonly used as local dry applications, for example: hot water bottle, chemical heating pad, thermoregulated electric pad, standard floor lamp with light bulb, and heat cradle; local moist applications such as compresses, arm or foot soaks, sitz baths, irrigations, and hot vapor inhalations.

Table 5-2. General Precautions in Application of any Form of Heat

DO—	DO NOT—
Check the doctor's order.	
Know the patient's condition and the purpose for which the heat application is intended.	Do not leave a helpless or confused person alone while undergoing treatment with a hot application.
Verify the temperature of the application with the most reliable testing device available.	
Place a layer of dry cotton cloth between the patient's skin and a rubber-covered (or plastic) heating device.	Do not put a rubber or plastic-covered heating device directly on a patient's skin.
Observe the local skin area before, during, and after the heat application.	Do not rely on the patient to complain of pain. Repeated applications bring increased tolerance to the sensation of heat, and a burn can occur without the patient complaining of pain.
When continuous moist heat is ordered, remove for 1 hour every 12 hours or more often to prevent maceration of skin.	
Discontinue application immediately when a local reaction of skin redness appears.	Do not reapply heat to an area in which heat-induced redness persists.
Prevent chilling and exposure following heat application.	

NOTE

For general precautions when applying heat, see table 5-2. Record in Nursing Notes the type of application, time, area to which applied, and patient's reaction.

HOT WATER BOTTLE

1. Fill a pitcher with hot water. Test temperature with a bath thermometer. The temperature should be no more than 120 degrees.
2. Pour water into bottle to fill to one-half. Expel air by gradually resting the bottle flat on a table until the water reaches the neck of the bottle. Expelling the air makes the bottle pliable so that it will conform to body contours.
3. Secure the stopperless closure by folding over

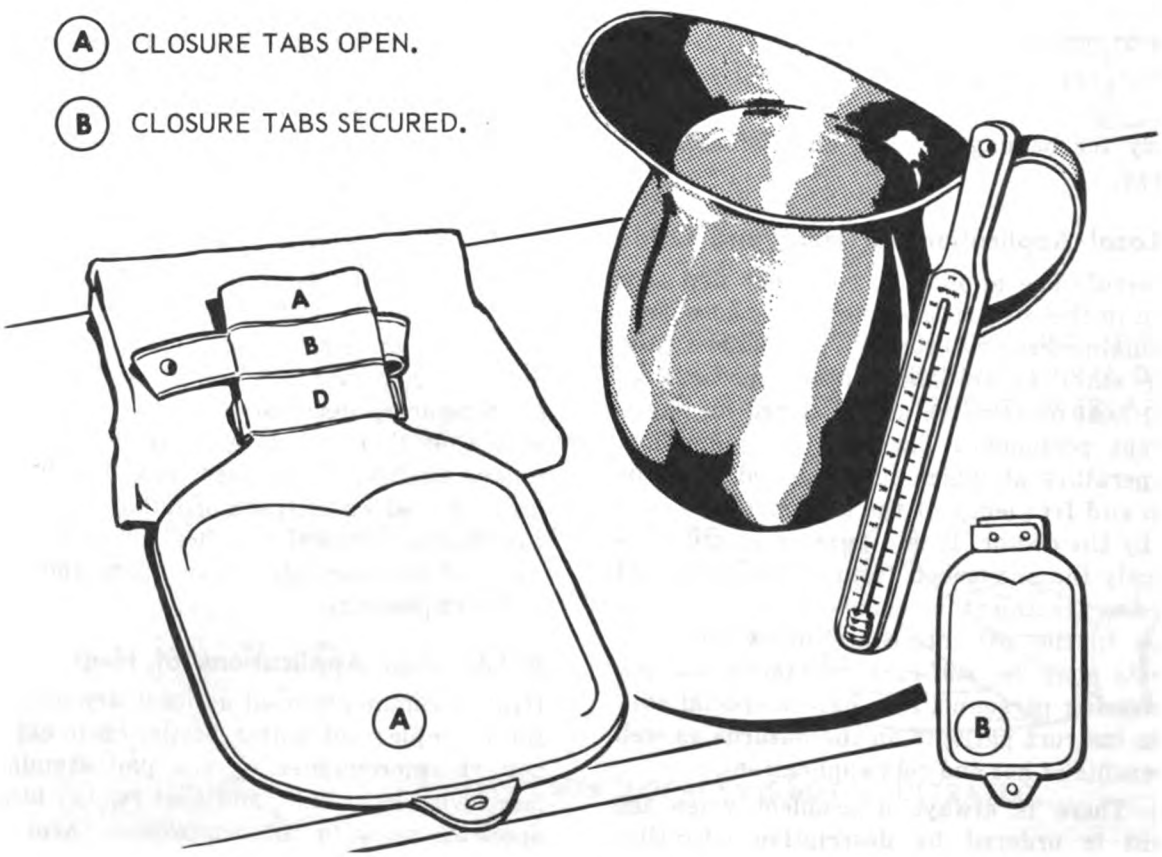


Figure 5-39. Preparation of hot water bottle.

the neck tabs in proper sequence. (A tab first, B tab second, etc.)

4. Test for leaks. Wipe surface dry. Cover with a hand towel or other dry cloth cover.
5. Apply to prescribed area. Tell the patient that is is only intended for the area to which applied.
6. Check skin area before refilling and reapplying; do not apply if an area of heat-induced redness is apparent.

CHEMICAL HEATING PAD, WATER-ACTIVATED

The standard chemical heating pad (fig. 5–40 Ⓐ) in field unit equipment comes complete with a stick and a waterproof cover. Cold water is poured into the opening to activate the chemicals.

1. Clear the opening with the stick.
2. Pour in 30 ml of cold water.
3. Manipulate (knead) the bag briskly with the fingers to mix the water and chemicals.
4. Place the pad in the cover and apply as directed.

CAUTION

The amount of heat generated cannot be controlled and will continue for several hours.

5. Check skin area and bag frequently. Apply additional covering between the patient and the pad p.r.n.

HOT-COLD CIRCULATING PAD (K-PAD)

This device (fig. 5–40 Ⓑ), a standard item, is a special form of electric pad which is safe to use for both dry and moist applications. Unlike the conventional electric pad, there are no electric wires in the pad itself. Water heated to the prescribed temperature circulates from a reservoir through coils inclosed within a lightweight, flexible plastic cover.

1. Use distilled water to fill reservoir.
2. When used for dry applications, inclose the pad in a dry hand towel.
3. When used for moist applications, place the pad over a protective dry covering, unless otherwise directed.
4. Keep the thermostat setting at the prescribed temperature. Safeguard the key used to set the thermostat and do not allow tampering with the thermostat.
5. Check electric connections to the reservoir to be sure the wiring and plug are not damaged.

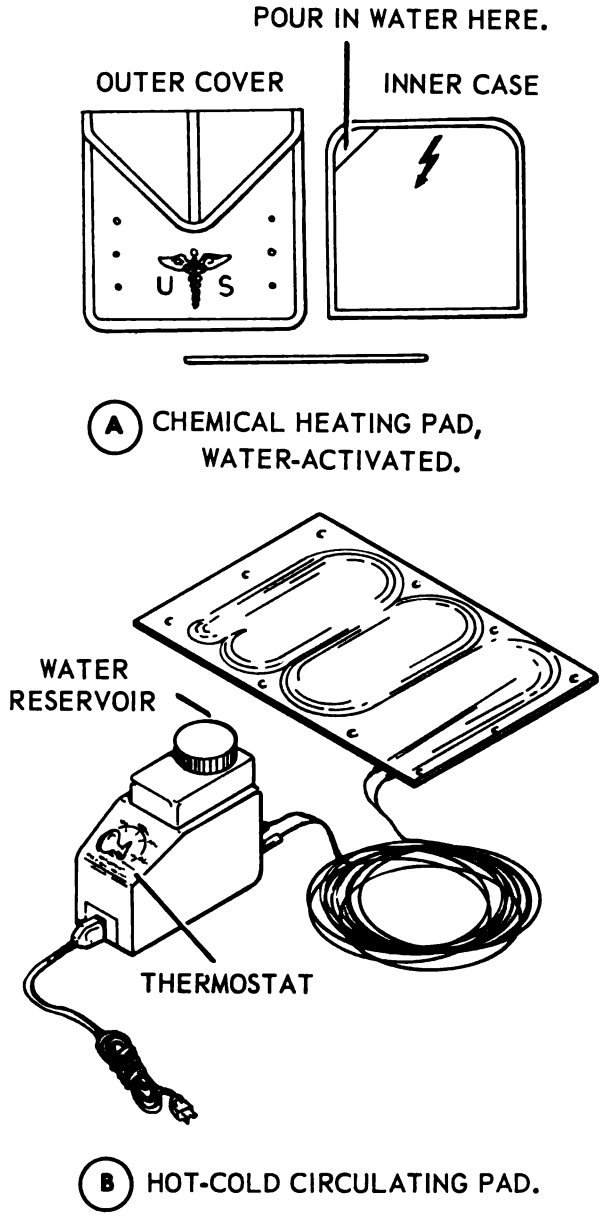


Figure 5–40. Heat treatment pads.

6. Keep pad in place with bandage ties or a towel binder. Do not puncture any part with safety pins.

FLOOR LAMP HEAT APPLICATION

This treatment is often prescribed to promote healing of perineal wounds (male or female) or excoriated (raw) tissue areas associated with lesions such as a decubitus ulcer or the skin area around an unregulated colostomy. The purpose of this form of treatment is to expose to warmth, light, and air a body lesion lying between moist skin folds or one usually covered by a protective dressing. Heat lamp treatment in ward patient care utilizes a standard gooseneck floor lamp and

a 25- to 40-watt ordinary light bulb. The amount of heat is controlled by size of the bulb and distance from the exposed area. Unless otherwise specified, the light bulb is to be about 3 feet from the area treated.

Procedure

1. Screen the bed area to provide privacy.
2. Use aseptic technique in cleansing the area to be exposed to the lamp.
3. Drape the area and position the patient for maximum exposure to the light and warmth. Prevent unnecessary exposure and chilling.
4. Check the patient frequently during the prescribed period of exposure (usually 15 minutes).
5. Be particularly vigilant to exclude flies since they are attracted to the serous drainage from the exposed wound.

5-54. Local Applications of Moist Heat, Clean Technique

Use clean technique for local applications—compresses or packs—applied to intact skin. In addition to observation for reaction to heat, skin exposed to moisture for a prolonged period must be observed for any sign of maceration (a destructive softening, puffiness, or wrinkling of the surface). Maceration is prevented by exposing the skin to air for ½ to 1 hour between reapplications of moist heat; this step is important when moist heat is prescribed as a "continuous reapplication." Follow all precautions in table 5-2.

MOIST HOT COMPRESSES (CLEAN)

Compresses are applied to small, local areas. Gauze pads of sufficient size or clean folded washcloths may be used. Ambulatory patients may be instructed to use hot tap water at a conveniently located sink. When compresses are applied at the bedside, obtain a hot plate of approved design and a clean washbasin.

Procedure for Bed Patient

1. Place the hot plate on a table convenient to use. Plug in the plate and turn switch to low.

CAUTION

Never leave a hot plate unattended near a helpless or confused patient.

2. Place basin of water, at a temperature of 110 to 115 degrees, on the hot plate. Do not allow solution to be hotter than the hands can comfortably stand. Place gauze pads or folded washcloths in the hot solution.
3. Place patient in comfortable position, with covered treatment sheet under the body part to be treated in order to protect the bed.
4. Lift hot wet compress from basin. Wring out as dry as possible. Test heat of compress against inner surface of forearm. Lay hot compress gradually on area to be treated, lifting corners to eliminate any steam.
5. Observe skin carefully for redness before reapplying compress. If no unfavorable skin reaction is observed, exchange the cooled compress for a heated one, continuing reapplications for the prescribed length of time, usually for 20 minutes.
6. Turn off hot plate switch and disconnect wall plug after each treatment. Compress may be reused it not soiled.

NOTE

If compresses are to be self-applied by the patient, demonstrate the entire procedure to the patient and have him repeat it. Check from time to time to see that instructions are being followed and to observe skin area.

MOIST HOT PACKS (CLEAN)

Packs (also referred to as massive wet dressings) are applied to a large area such as an entire leg or arm. Bath towels wrung out of hot water are wrapped around the designated area and then bound in place with a moisture-impervious covering. Hot water bottles, chemical heating pads, or a K-pad may be used to keep the pack hot. The extremity being treated is usually elevated and kept at rest during treatment.

Equipment

Hot plate of approved design
Large washbasin with tap water or prescribed solution
Bath towels, 3
Bath thermometer
Rubber or plastic sheeting, for dressing
Safety pins
Prepared hot water bottle, chemical pads, or K-pad
Safety pins or roller bandage
Protective cover, for bed
Pillows for elevation

Procedure

1. Place the hot plate on a table in a spot conven-

ient to use and safe for the patient. Plug in the plate and turn the switch to low.

CAUTION

Never leave a hot plate unattended near a helpless or confused patient.

2. Place basin of solution, at a temperature of 110 to 115 degrees, on the hot plate. Solution should be no hotter than the hands can comfortably stand. Place two bath towels folded in half in the basin of hot solution.
3. Place patient in comfortable position with extremity to be treated elevated properly and completely exposed. Place covered protective sheet under the extremity and over the pillows. On top of protective bed covering, place dry bath towel and rubber or plastic sheeting to bind the hot pack in place.
4. Wring out and test hot towels by touching one to your forearm. Place one hot folded towel under and one over the extremity to be treated in order to completely inclose it. Fold plastic or rubber layer over to inclose hot moist towels. Then fold over the dry towel and pin or fold securely to keep the pack in place.
5. Apply hot water bottles or K-pad to the outside of the towel binding as needed to maintain the pack's heat.
6. Reapply hot pack as prescribed, checking condition of the skin each time. When properly applied, it is possible to maintain the required amount of heat and moisture for about one hour with each hot towel application.
7. When pack is discontinued, pat skin dry.
8. If pack is to be continued day and night, set up a schedule for reapplying to allow a required period of exposure of skin to air. Use clean towels next to the skin p.r.n. to prevent a sour odor. Wash and gently dry the inclosed skin area to remove perspiration and skin secretions, cleansing the skin in this manner before the air exposure period.

ARM OR FOOT SOAKS

The part to be treated is immersed in water or in a prescribed solution, using a large washbasin or oval foot tub. When ordered for treatment of an open wound, sterile equipment and solution are used to reduce contamination; once the part is immersed, however, any organisms present contaminate the solution, and sterility cannot be maintained. The initial use of sterile equipment and a sterile towel to dry the area provides a margin of safety.

Procedure

1. Place the patient in a comfortable, well-supported position, whether in bed or seated on a chair.
2. Put basin or tub in position, placing it on a level, secure surface. Protect the bed, table, or floor p.r.n. with newspapers or a rubber sheet.
3. Start with water or solution at about 105 degrees. Assist patient to immerse his arm or leg. Using a pitcher, pour additional water, heated up to 120 degrees, into the basin or tub.

CAUTION

Pour away from the immersed part to avoid burning the patient.

4. Drape a towel or plastic cover over the tub to retain the heat during the soak period.
5. Following treatment, pat the immersed area dry. Observe and record the appearance of the involved area. Reapply protective dressing p.r.n.

5–55. Warm, Wet, Wound Dressings, Sterile Technique

Warm, wet dressings are ordered as a form of intensive treatment of an infected wound. Two major problems in this treatment are (1) to prevent introducing additional bacteria into the wound; and (2) to prevent wound drainage from contaminating the surrounding area, the patient's environment, and the personnel caring for the patient. The method used must be based on observance of aseptic techniques.

a. Interval of Application. The order will indicate the interval for maintaining heat and moisture. It may be "apply dressing every 2 hours for 30 minutes," or simply, "continuous warm moist dressings for 48 hours." In the latter case, the dressing technique should be to remove and replace dressing q. 2 h. This technique provides opportunity for inspecting the skin at regular intervals to detect any sign of maceration. In addition, the dressing saturated with drainage is removed from the infected area instead of seving as an incubation point for multiplication of pathogenic organisms.

b. Precautions to be Observed.

- The infected tissue is already damaged and can

tolerate only controlled amounts of heat and pressure.

- In addition to aseptic dressing techniques, an appropriate means of maintaining warmth, moisture, and a protective covering to control seepage are needed.
- If an extremity is involved, the arm or leg should be elevated. Bed rest, the use of a cradle, and pillow elevation of the involved part must all be considered.

EQUIPMENT

For Setting Up a Sterile Field:
- Dressing set, 2
- Sponge bowl
- 4" x 8" compresses
- ABD pads
- Plastic cover*
- Flask of prescribed solution
- Transfer forceps

Washbasin
Gauze bandage
Hot-cold circulating pad or hot water bottle
Hand towel
Safety pins
Rubber sheet
Bath towel
Emesis basin
Paper bag or newspaper
Tray
Pillows and bed cradle p.r.n.

* Sterile plastic or other sterile moisture-impervious protective material will be available from a CMS with ethylene oxide gas sterilization capability. A dry sterile cover on the moist dressing is important.

PROCEDURE

1. Place unopened flask of prescribed sterile solution in basin of hot tap water to warm solution. Allow 20 to 30 minutes, with renewal of hot water.
2. Explain procedure to patient.
3. Turn back bedding. Expose area to be treated. Place covered rubber sheet under part to be treated. If this part is an extremity, elevate on pillows, placing rubber sheet and cover on top of pillow surface.
4. Prepare bed stand or supplementary table space.
5. Wash hands.
6. Set up sterile field. Set up one field for removal of dressing p.r.n. Set up wet dressing field on separate tray.
7. Remove soiled dressing. Cleanse wound area. Discard instruments. Wash hands.
8. Place 4- by 8-inch gauze in sterile basin. Pour warm sterile solution over it. With two forceps, wring slightly to remove excess moisture, but retain wetness. Place several layers of wet gauze directly on wound surface. Cover wet gauze surface with ABD pad, and then cover ABD pad with plastic sheet. (When applied to an extremity, the plastic may be secured with one or two turns of roller gauze.)
9. Place pre-set aquamatic pad on the plastic over the wound area. Cover aquamatic pad with hand towel to concentrate warmth. If hot water bottle is used, apply and support in place with towel binder.
10. Adjust cradle over body area.
11. Remove and clean equipment. Wash hands.
12. Repeat procedure in 2 hours or at specified intervals. For maximum safety, use sterile dressing sets for each change of wet dressing. Note amount of drainage and condition of skin. Report puffiness or wrinkling immediately.

5-56. Throat Irrigation

A throat irrigation is an effective means of applying moist heat to the upper pharynx to relieve inflammation and mechanically wash out sticky secretions. The patient holds the irrigating tip and directs the flow of solution, while the medical specialist instructs and assists. This is a clean, but nonsterile, procedure.

EQUIPMENT

Irrigation set, with—
- Irrigating can
- Tubing 18 to 24 inches in length
- Plastic/glass connector tip

Large washbasin
Solution—hot tap water (115–120 degrees) or hot saline (1 level teaspoon salt to 1 pint of water)
Rubber treatment sheet
Bath towel
Safety pin

PROCEDURE

1. Test solution—it should be as hot as the patient can tolerate but not over 120 degrees.
2. Have the patient sit upright. Place the rubber sheet and bath towel bib fashion around his neck.
3. Place the washbasin on an elevated over-the-bed table in front of the patient. If a table is not available, have the patient hold the basin.

Figure 5–41. Throat irrigation.

4. Instruct the patient to hold his head forward, to exhale and then hold his breath while the solution is flowing, and to direct the flow to the painful throat area (fig. 5–41). Assure him the flow of solution will be controlled to permit him to rest and breathe at frequent intervals.
5. Pinch the tubing, elevate the can, and hand the patient the glass tip.
6. Release the tubing as he exhales. Watch the patient to insure that he does not choke. Pinch the tubing and lower the irrigating can as he rests and takes a breath. When all the solution has been used, discontinue the treatment.
7. Leave the patient dry and comfortable. (An ice collar is an effective followup to the hot throat irrigation.)
8. Rinse the irrigating can and basin thoroughly. Since the treatment is most effective if repeated q. 3 h. or q. 4 h., the can and basin may be inclosed in a clean paper bag or towel and left at the bedside between treatments. If treatment is continued for more than 1 day, exchange the used irrigating set for a fresh set from CMS.

5–57. Sitz Bath

In this procedure, the patient sits in a tub of water immersed to the hips only. The sitz bath is commonly ordered to promote healing following rectal surgery such as hemorrhoidectomy or to treat pelvic inflammation. A standard portable sitz bath chair (fig. 5–42) may be available for bedside treatment. However, the bath is usually given in an ordinary bathtub. The initial bath must be prepared for the patient and the procedure supervised. As the patient tolerates the treatment and gains strength and confidence, it becomes a self-care measure.

Figure 5–42. Sitz bath chair.

PROCEDURE FOR POST-RECTAL SURGERY

This procedure is based on the use of a standard bathtub. The temperature of the water and the duration and frequency of bath are as ordered. The bathroom should be warm and free of drafts, and the patient should return to his bed to rest following the procedure.

1. Preheat the clean tub by rinsing with hot tap water. Then fill to a depth of 8 inches with water at about 105 degrees.
2. Place an inflated rubber ring or a sponge rubber ring in the tub for the patient to sit on.

NOTE

A clean footstool may be placed in the tub for elevation of the patient's legs and feet during the sitz bath. This measure helps concentrate the hot soak effect on the pelvic area.

3. Assist the patient to undress and to sit in the tub, on the ring, with his knees drawn up to his chin or with feet elevated on the stool. If a T-binder and dressings are used, remove these before immersion.

CAUTION

Do not attempt to remove packing, if present.

4. Drape shoulders with a dry bath towel or cotton blanket p.r.n.
5. If water temperature is to be increased, add hot water gradually after positioning the patient.

CAUTION

Do not exceed 120 degrees.

6. Check water temperature every 5 minutes. Regulate as needed by gradually draining off cool water and adding hot water.
7. Check patient's pulse and tolerance of the procedure during the treatment, which may last from 5 to 20 minutes.

CAUTION

If patient is left in the tub unattended, be sure that the door is unlocked and that the patient has a tapbell.

8. Assist the patient out of the tub p.r.n. Assist with replacement of clean, dry dressing and T-binder p.r.n. Assist back to bed.
9. Scour the tub. Wash and dry the footstool and rubber ring.

5-58. Local Applications of Cold

Cold is applied to small localized areas of the body in a dry form by means of an ice bag or in a moist form by means of iced, moist compresses. Continuing contact with cold produces numbness as well as constriction of blood vessels. While both of these effects may be desired, the area to which cold is applied must be watched closely since the patient may not complain of symptoms indicating possible tissue damage. Local signs of unfavorable reactions to cold include pallor, blueness, or mottling (blotchy) discoloration of the skin. If these signs are noticed, discontinue the application immediately and report the observation. When continuous moist cold is ordered, remove for 20 minutes every 2 hours.

APPLICATION OF ICE BAG

The ice bag may be a dual-purpose, hot water bottle or an ice collar. (A securely tied plastic sack or latex rubber glove may also be used to advantage when a flexible, lightweight container is needed to apply ice to the eye or nose.)

Procedure

1. Crack or crush the ice to eliminate large pieces and sharp edges.
2. Fill the container only half full with ice; expel all air so that it will be flexible. Close securely and test for leaks.
3. Wipe the surface of the container dry. Inclose it completely in a dry cloth, using a cloth bag, stockinette, several layers of gauze, or a hand towel.
4. Apply container so that it is in contact with the designated local area, propping where necessary to relieve weight and pressure.
5. Check and refill as necessary to keep the local area cold for the prescribed period.

NOTE

Always change the cover if it becomes moist.

6. Observe the skin area carefully. Discontinue application and report unfavorable reactions stat.
7. When treatment is discontinued, drain, wash, dry, and inflate the bag with air before returning it to its proper storage place.

APPLICATION OF COLD COMPRESSES

The compress should be several layers thick and of sufficient size to cover the designated area. Gauze pads or clean, folded washcloths are used. These are often self-applied, following instructions and initial assistance.

Procedure

1. Place protective cover under the part to be treated to protect the bedding.
2. Place large pieces of ice in a hand basin or sponge bowl. Place moistened compresses or clean folded washcloth (in sufficient number to permit frequent exchange) on the ice.
3. Squeeze excess moisture from a chilled compress and apply quickly to designated area. Do not cover the compress.
4. As the compress loses its coolness, exchange it for a freshly chilled and moistened one. This step is repeated every 1 or 2 minutes for the 15- or 20-minute application period.
5. When treatment is discontinued, wash and dry the basin.
6. Start each application with clean water and ice. Replace gauze or washcloth p.r.n. as they become soiled.

5-59. General Application of Cold

Cooling of the entire body is accomplished by means of a special hypothermia unit (cooling blanket) used under the supervision of an anesthetist or by a cooling sponge bath given by nursing personnel. Only the cooling sponge bath is discussed in this section, as nursing personnel who assist in the care of a patient receiving hypothermia unit treatment will follow the policy established by local authority.

COOLING SPONGE BATH

This is ordered to reduce body temperature when a patient has a temperature elevation, usually 103 degrees or over. An assistant may be required, depending upon the condition of the patient.

Equipment

Bed-length rubber sheet, 1
Cotton blankets, 2
Washcloths, 8
Bath towels, 2
Filled hot water bottle with cover
Filled ice bag with cover
Large basin half full of tepid (95 degrees) water, or cool to cold (75–90 degrees) water. (The order should specify the degree of coolness.)
Bottle of 70-percent alcohol

Procedure

1. Take and record TPR.
2. Prepare bed unit and patient as for a cleansing bed bath, placing the large rubber sheet and one cotton blanket so as to protect the foundation of the bed.
3. Place the ice cap to the patient's head and the hot water bag to his feet.
4. Place a cool, moist, folded washcloth, wrung out of the sponging solution, in each axilla, each groin, and under each knee. Replace these frequently as they become warm.
5. Following the same order as in the cleansing bath, omitting the hand and foot soak and the pubic area, sponge the patient's body. Use long light strokes with the well-moistened cloth, sponging the anterior body for 3 minutes and the back for 7 minutes. Exchange cloth in use as it becomes warm with the cloth in the cool solution.
6. Repeat the entire sequence, for a total of 20 minutes sponging. Completely expose the part of the body being sponged to allow evaporation and to aid cooling.
7. During treatment, observe color and pulse.

CAUTION

Stop treatment if pulse increases and shivering starts. Wrap patient in a dry cotton blanket and report reaction stat. to nurse or doctor.

8. Following the second sponging, pat the patient dry. Do not rub.
9. Apply alcohol in long, light strokes to arms, legs and back. Allow alcohol to evaporate; do not pat dry.
10. Remove rubber protective sheet. Remove ice cap and hot water bottle. Replace pajamas and light top covers. Leave patient in comfortable position in clean, dry bed.
11. Remove and clean equipment.
12. Check temperature by rectal thermometer ½ hour after cooling sponge. Take pulse and respiration. Compare with baseline TPR.
13. Record TPR. Record treatment and patient reaction on Nursing Notes; verbally report results to nursing team leader or doctor.

MODIFICATION OF COOLING SPONGE

When rapid reduction of a very high temperature is required, cool the body quickly by placing bath towels wrung out of cold, or even iced, water on the exposed extremities, back, chest, and abdomen. Use only a loin cloth to drape the patient. Change the towels in succession as they become warm. In extreme cases, the doctor may order an electric fan to blow over the moistened towels to increase evaporation and cooling.

WARNING

Never use this method without the specific order of and supervision by the doctor.

5–60. Venipuncture

a. General. Venipuncture is the entering of a vein with a needle (1) to obtain a blood specimen for laboratory tests or (2) to inject medications or intravenous solutions. In Army Medical Department facilities, a medical officer usually performs all venipunctures for the purpose of injecting medications and solutions, and a qualified laboratory specialist performs venipuncture for the purpose of obtaining a blood specimen. Local policy determines when a nurse officer, clinical specialist (91C), or medical specialist (91B) performs a venipuncture for any reason.

b. Site for Venipuncture. The recommended site for venipuncture when performed by the clinical or medical specialist is the antecubital area of either forearm, just below the bend of the elbow. In this area, branches of two major superficial veins, median basilic or median cephalic, are prominent and usually accessible through a skin puncture. Alternate sites may be selected by the medical officer for venipuncture such as accessible superficial veins in the dorsal area of the hand, wrist, or foot.

EQUIPMENT

IV tray with—
Sterile needles, assorted sizes 18–20, 2 inches long, individually wrapped in plastic or glass tubes
Sterile dry syringes, sizes 5 to 20 ml., individually wrapped
Blood specimen collection tubes and vials from the laboratory[1]
Flexible latex tubing, about 18 inches long (for tourniquet)[2]
Gauze, 2 inch x 2 inch squares in container of prescribed skin germicide (or foil packet)
Sterile package of dry 2 inch x 2 inch gauze
Rubber or plastic protective sheet
Towel

[1] Vials for unclotted blood specimens contain an anticoagulant such as sodium citrate. Always verify what type tube is to be used.
[2] Do not use too short a length of tubing—although it can be stretched for application, it will be too constricting.

PROCEDURE

1. Place an identifying label on the blood collecting tube.
2. Wash hands.
3. Assemble needle and syringe. Attach needle so that its bevel and the syringe graduations are visible on the same side. Test assembly by pulling plunger back and forth to insure that the needle is not plugged and that the syringe works smoothly. Push the plunger all the way into the barrel to eliminate all air; then replace the needle protector tube before setting syringe assembly aside temporarily.
4. Position patient so that the fully extended arm is supported at bed or table level. Roll sleeve well above the elbow.
5. Place protective sheet and towel under the extended elbow and forearm.
6. When applying a tourniquet, use soft-walled latex tubing about 18 inches in length. Place tubing around limb about 2 inches above site of venipuncture. Hold one end so that it is longer than the other, forming a loop with the longer end. Pass this looped end under the shorter end of the tourniquet. When placing tourniquet, be certain tails of tubing are turned away from proposed site of injection. Apply tourniquet (fig. 5–43) tight enough to stop venous flow but not so tightly that radial pulse cannot be felt. Tell patient to open and close fist several times to increase circulation.

CAUTION

Do not leave tourniquet tightened for more than 2 minutes at any one time.

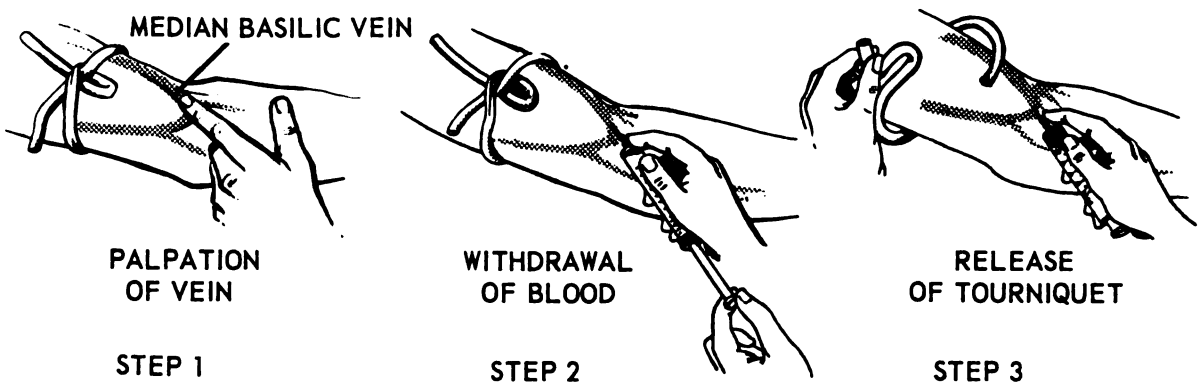
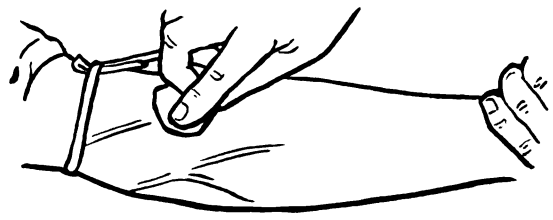


Figure 5–43. Applying a tourniquet for venipuncture.

Technique of Obtaining Blood By Venipuncture

Step 1. Select prominent veins in the antecubital area. Wet area with germicide to facilitate palpitation of veins with fingertips. Touch distended vein with fingertips and estimate tissue support; the vein selected should not roll unduly. Tell patient to close fist and keep it closed until further notice.

Step 2. Cleanse skin over selected area with germicide-saturated gauze square, using firm circular movements from center outward. Allow skin to dry. Discard gauze in basin.



Step 3. Pick up assembled syringe and needle. Remove needle protector tube, and check to insure that plunger is all the way into the barrel. Grasp syringe with needle bevel up. Place forefinger on needle hub to guide it during insertion through the skin and into the vein.

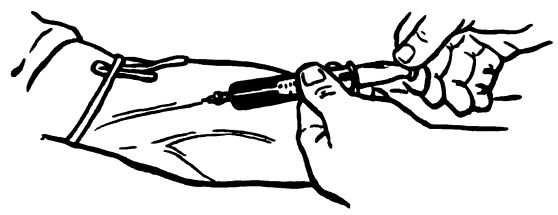
Step 4. Position self so as to have a direct line of vision along the axis of the vein to be entered.

Step 5. With free hand, draw skin below cleansed area downward to hold the skin taut over selected puncture site. Place needle point, bevel up, parallel to and about ½ inch below the site of the venipuncture.

Step 6. Holding needle at approximately a 30-degree angle, insert it through the skin, lower it to a flat angle, and then move it forward parallel to the vein for about ½ inch.

Step 7. Direct needle point into vein with a slight sidewise movement. A faint "give" will be felt, and on entry into the lumen of the vein, blood will appear in the syringe. Advance needle slightly, watching for increased blood flow. Use care to prevent the through-and-through penetration of the vein walls with the needle; keep needle at same angle.

Step 8. If venipuncture is successful, obtain the blood specimen. Hold syringe and needle steady with one hand, and use the other hand to aspirate by gently pulling on the plunger to obtain the required amount of blood.



NOTE

If venipuncture is unsuccessful, withdraw the needle slightly and try once again to direct the needle point into the vein before withdrawing the needle from the skin.

CAUTION

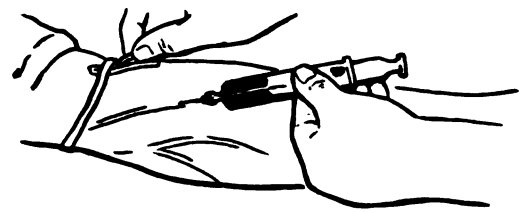
On repeated failure, release the tourniquet. Withdraw the needle, placing a dry, sterile, 2- by 2-inch gauze square over the needle site as the needle is withdrawn. Notify nurse or medical officer before attempting to enter another vein.

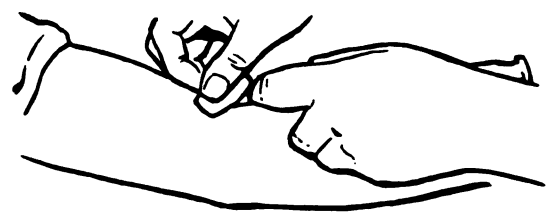
Step 9. Release tourniquet, telling patient to relax and open his clenched fist.

NOTE

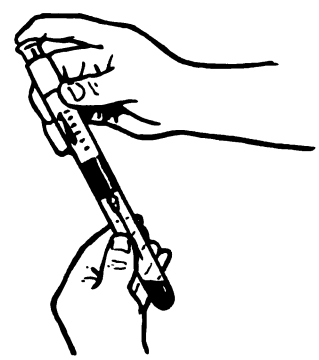
The tourniquet is removed after obtaining required specimen but before withdrawing the needle from the vein.

Step 10. Place a dry, sterile, 2- by 2-inch gauze square over the needle site and withdraw needle. Tell patient to keep arm extended and to press gauze gently against puncture area for 2 or 3 minutes.





Step 11. Collect required blood specimen from syringe as soon as possible, before blood starts to clot. Always remove needle from syringe and run blood down on inner side of the collection vial, using gentle pressure on the plunger to avoid foam and injury to the blood cells. If the vial contains anticoagulant, insert stopper and gently invert several times to mix.



CAUTION

Never shake the blood collection vial.

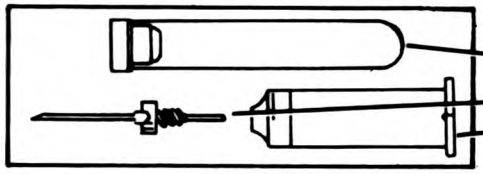
Step 12. Adjust patient's sleeve and leave him in a comfortable position.

Care of Equipment

1. Immediately aspirate cold water into reuseable syringe and needle. Use care to protect self from needle puncture.
2. If disposable equipment is used, place needle protector on needle and snap off shaft to prevent misuse; hold a disposable syringe in a fold of towel and break the syringe before discarding it in a waste receptacle.
3. Remove tourniquet and protective sheet from the bed. Check the puncture site. Usually, no dressing is needed after initial pressure period. If blood continues to ooze from the puncture site, apply a small dry dressing, using a dry, sterile 2- by 2-inch gauze pad and adhesive tape, or a sterile adhesive compress strip.

CAUTION

Be sure to record venipuncture and the specimen collected.



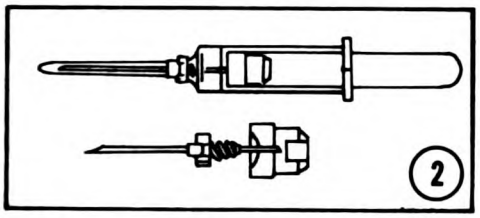
THE VACUTAINER SYSTEM CONSISTS OF

EVACUATED TUBE WITH RUBBER STOPPER.

DOUBLE POINTED NEEDLE.

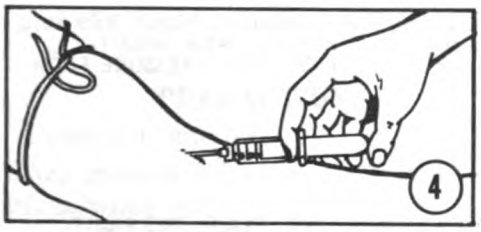
PLASTIC HOLDER WITH GUIDELINE.

NOTE: HOLDER AND NEEDLE ARE ALSO SUPPLIED ASSEMBLED, IN STERILE PACKAGE.

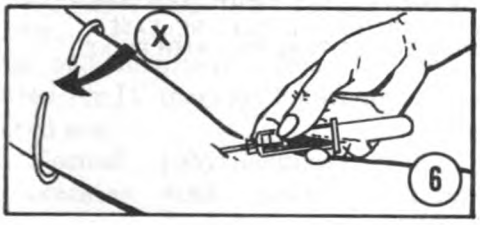


DIRECTIONS

1. THREAD NEEDLE INTO HOLDER SECURELY.
2. INSERT TUBE IN HOLDER ONTO NEEDLE UNTIL LEADING EDGE OF STOPPER MEETS GUIDELINE ON HOLDER. THE STOPPER AND TUBE WILL RETRACT SLIGHTLY. LEAVE IN THIS POSITION. NEEDLE IS NOW EMBEDDED IN STOPPER DIAPHRAGM AND VACUUM IS MAINTAINED.
3. PREPARE FOR VENIPUNCTURE IN USUAL MANNER.



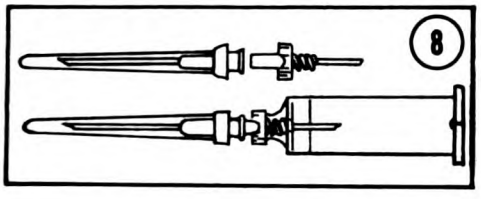
4. AFTER NEEDLE IS UNDER SKIN, PLACE FIRST TWO FINGERS OF HAND BEHIND FLANGE OF HOLDER AND PLACE THUMB OF SAME HAND ON END OF TUBE. GENTLY PULL WITH FINGERS ON FLANGE WHILE PUSHING ON TUBE WITH THUMB UNTIL TUBE IS PUSHED ONTO NEEDLE TO BOTTOM OF HOLDER.
5. IF NEEDLE IS IN VEIN, BLOOD WILL FLOW INTO TUBE. WHEN BLOOD ENTERS TUBE, PROBE FOR VEIN UNTIL VEIN ENTRY IS INDICATED BY BLOOD FLOWING INTO TUBE.
6. RELEASE TOURNIQUET WHILE TUBE IS FILLING. (X)



7. WHEN VACUUM IS EXHAUSTED AND BLOOD NO LONGER FLOWS INTO TUBE, REMOVE ENTIRE ASSEMBLY FROM ARM. THE TUBE MAY THEN BE REMOVED FROM THE HOLDER.

ADAPTER

8. THE VACUTAINER ADAPTER MAY BE USED WITH LUER SLIP NEEDLE IN PLACE OF VACUTAINER NEEDLE. THREAD ADAPTER INTO VACUTAINER HOLDER SECURELY. ATTACH LUER NEEDLE TO END OF ADAPTER. PROCEED PER DIRECTIONS FROM #2.



MULTIPLE SPECIMENS

9. FOR MULTIPLE SPECIMENS WITH ONLY ONE VENIPUNCTURE, REMOVE TOURNIQUET WHILE FIRST TUBE IS FILLING AND PROCEED WITH EITHER OF THE METHODS FOR CHANGING TUBES AS DESCRIBED BELOW.
10. WHEN ALL BLOOD SAMPLES ARE DRAWN, REMOVE ENTIRE ASSEMBLY FROM ARM. THE LAST TUBE OF BLOOD MAY THEN BE REMOVED FROM HOLDER.

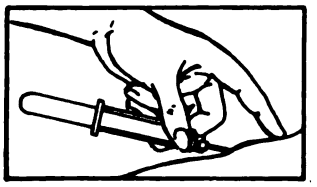
NOTES

1. TUBES WITH POWDERED ANTICOAGULANTS SHOULD BE TAPPED NEAR THE STOPPER TO DISLODGE ANY ANTICOAGULANT THAT MAY BE BETWEEN STOPPER AND WALL OF TUBE.
2. ALL TUBES WITH ANTICOAGULANTS SHOULD BE FILLED TO THE EXHAUSTION OF THE VACUUM TO INSURE PROPER RATIO OF ANTICOAGULANT TO BLOOD.
3. ALL TUBES WITH ANTICOAGULANTS SHOULD BE MIXED THOROUGHLY BY GENTLE INVERSION SEVERAL TIMES. DO NOT SHAKE VIGOROUSLY. SOLUBILITY OF SOME ANTICOAGULANTS IS SLOW (E.G., SODIUM FLUORIDE). THEREFORE LONGER MIXING MAY BE REQUIRED. IF MULTIPLE SAMPLES ARE DRAWN, TUBES MAY BE MIXED WHILE SUCCEEDING TUBES ARE FILLING.

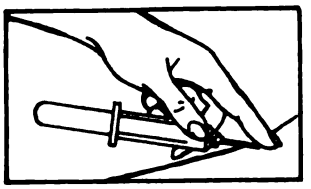
Figure 5–44. Vacutainer® method of blood specimen collection.

METHODS FOR CHANGING TUBES

IF IN VEIN WITH NEEDLE BEVEL UP:

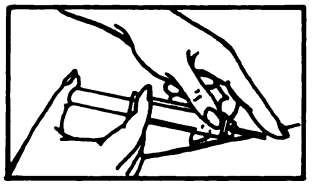


1. USE THUMB AND 2D FINGER OF LEFT HAND TO GRASP BOTTOM OF HOLDER.



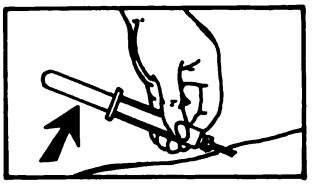
2. GENTLY PRESS PAD OF LEFT-HAND INDEX FINGER OVER NEEDLE BEVEL, AS IT IS POSITIONED IN VEIN, TO STOP BLOOD FLOW.

3. PLACE RIGHT-HAND THUMB AGAINST HOLDER FLANGE, KEEPING IT AWAY FROM TUBE, USING THUMB TO PUSH AGAINST FLANGE. WRAP RIGHT-HAND FINGERS AROUND TUBE AND PULL TUBE OUT WITH PRESSURE FROM FINGERS.

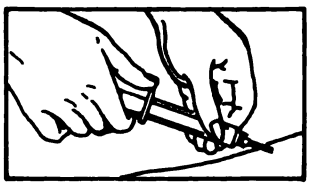


4. STORE FILLED TUBE SAFELY. PICK UP NEW TUBE, PLACE TWO RIGHT-HAND FINGERS BEHIND HOLDER FLANGE AND USE RIGHT-HAND THUMB TO PUSH TUBE ALL THE WAY ONTO PUNCTURE NEEDLE. RELEASE LEFT-HAND FOREFINGER FROM VEIN TO LET TUBE FILL WITH BLOOD.

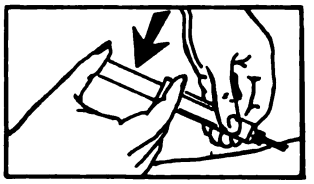
IF IN VEIN WITH NEEDLE BEVEL DOWN:



1. WITH LEFT HAND, RAISE TUBE HOLDER, TO PRESS NEEDLE BEVEL AGAINST LOWER VEIN WALL AND OCCLUDE BLOOD FLOW.



2. PLACE RIGHT-HAND THUMB AGAINST HOLDER FLANGE, KEEPING IT AWAY FROM TUBE. USING THUMB TO PUSH AGAINST FLANGE, WRAP RIGHT-HAND FINGERS AROUND TUBE AND PULL TUBE OUT WITH PRESSURE FROM FINGERS.



3. STORE FILLED TUBE SAFELY, PICK UP NEW TUBE. PLACE TWO RIGHT-HAND FINGERS BEHIND HOLDER FLANGE AND USE RIGHT HAND THUMB TO PUSH TUBE ALL THE WAY ONTO PUNCTURE NEEDLE. LOWER TUBE HOLDER TO RE-POSITION NEEDLE IN VEIN LUMEN, LET TUBE FILL WITH BLOOD.

Figure 5-44—Continued.

Alternate Measure—Vacutainer®

An alternate method of venipuncture is illustrated in figure 5–44.

5–61. Intravenous Infusion

Intravenous infusion is the introduction of large amounts of fluids into a vein to replace or maintain the supply of body fluids, electrolytes (body salts), and some nutrients. The venipuncture and the start of intravenous therapy are usually performed by a medical officer. In emergency situations, however, these procedures may be performed by a trained assistant under the direct supervision of the medical officer if such a procedure is in accordance with local policy directives. Ordinarily, the medical specialist assists with IV procedures by preparing the patient, preparing the equipment, assisting the medical officer as necessary, and by continuing observation of the patient and the equipment during the intravenous procedure.

PRECAUTIONS

1. Use aseptic techniques.
2. Follow general rules for administering medications when working with any IV solutions. Always check solution labels with the doctor's order.
3. Use only solutions labeled as specially prepared for IV therapy. Solutions frequently ordered are:
   a. Normal (physiological) saline, which contains 0.85 percent sodium chloride in sterile distilled water. This is an example of an electrolyte solution often used in treating dehydration. Other salt solutions such as Ringer's contain several electrolytes in addition to sodium chloride.
   b. Glucose or dextrose, 5 percent in distilled water. These are carbohydrate (sugar) solutions, providing fluid and some nutrition. (Each 100 ml. of a 5-percent glucose or dextrose solution provides 20 calories.)
   c. Plasma expanders (colloid solutions) such as dextran. Dextran is supplied in 500 ml. units and is used in emergency treatment of shock or hemorrhage as a temporary substitute for blood.
   d. Whole blood supplied in 500 ml. plastic-pack units or 500 ml. glass flasks.
4. Watch for infiltration. This is indicated by swelling and coldness at the needle site, which is caused by the needle being out of the vein and fluid entering the tissues. Check the needle site at regular intervals and always after moving and changing the patient's position, whether or not an arm board or splint is used. To check, lower the IV solution bottle below the level of the patient's bed. If blood flows back into the IV tubing, the needle remains in the vein. If infiltration occurs, clamp off the tubing and notify the nurse or doctor. Do not attempt to manipulate the needle.
5. Watch for infusion reactions. These may be indicated by a chill or a sudden increase in pulse rate, dyspnea, chest pain, or restlessness. Clamp off the tubing immediately, and notify the nurse or doctor. If the infusion is discontinued, find out if the remaining solution and infusion tubing and needle must be saved for laboratory tests.
6. Watch level of solution in the flask. Do not permit fluid to run completely out of the neck of the flask. Clamp off the tubing before this occurs in order to prevent air from entering the tubing and subsequently the patient's vein.
7. Accurately record the IV fluids given on the I & O worksheet on the ward. Follow the exact procedure used locally for recording each unit started and the amount of each unit received.
8. Know how much IV fluid is to be administered over a given period of time and how to observe and regulate the rate of flow, which is ordered by the medical officer. As a general rule, 3 to 4 hours are required for each 1000 ml. of solution. For a patient in shock or in other emergency conditions, the fluid may be ordered to be given at varying rates.

CAUTION

A patient receiving IV fluids at an unusually fast or an unusually slow rate requires extra vigilant nursing observation.

9. To regulate the rate of flow, know the number of drops per milliliter delivered by the IV set used and the number of milliliters per minute the patient is to receive. Read the instructions on the carton in which the disposable IV set is packed to determine the number of drops per milliliter delivered by the set to be used. To calculate the rate of flow in drops per minute to be maintained, divide the total amount to be given by the total number of minutes, and multiply by the number of drops per milliliter delivered by the IV set used.

EXAMPLE:

1000 ml. is to be given in 3 hours.
The set used is calibrated to 10 drops per ml.

1000 ml. ÷ 180 minutes + 5.5 ml. per minute
5.55 ml. × 10 = 55.5 drops

ANSWER: Regulate the drip device by adjusting the clamp to deliver 56 drops per minute for a period of approximately 3 hours.

EQUIPMENT

IV tray
Disposable IV infusion set
Polyethylene intravenous catheter, as ordered
Solution ordered
IV standard
Padded arm board p.r.n.
Gauze bandage p.r.n.

PROCEDURE WHEN ASSISTING WITH IV INFUSION

1. Assemble equipment.

CAUTION

Compare label on flask of solution with doctor's order.

2. Prepare patient by explaining what is to be done and by reassuring him.
3. Offer a bedpan or urinal.
4. Place patient in as comfortable position as possible, preferably supine, with either arm accessible for choice of venipuncture site.
5. If bedside cabinet is used for the IV tray, remove unnecessary articles.
6. Place the IV standard at the head of the bed convenient to but not obstructing the work area.
7. Cut three adhesive strips, about 4 inches long and ½ inch wide, and stick these loosely to the IV standard. They will then be accessible for securing the needle in place following the venipuncture.
8. Just before the venipuncture, remove the tubine from the carton and from the plastic envelope.

CAUTION

Use aseptic techniques: wash hands; expose sterile equipment to air for minimal amount of time.

9. Check to see if there is an airvent needle in the set and a venipuncture needle attached to the adaptor. If not, select a size 18 needle for the airvent and a size 20 needle for the venipuncture from the IV tray.
10. Remove the metal cap and discs from the solution flask. The surface of the stopper is sterile at this point and requires no wiping with germicide.

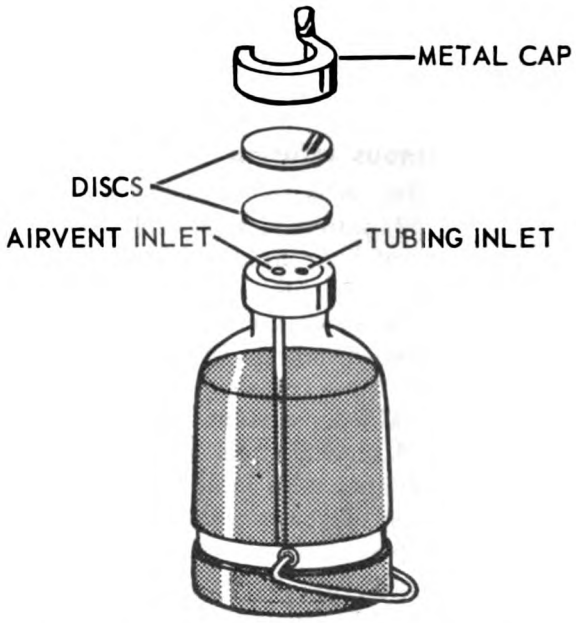


Figure 5–45. Identification of airvent inlet and tubing inlet (IV flask).

11. Identify the airvent inlet flow (fig. 5–45) and the tubing inlet on the flask. The airvent inlet communicates with the glass tube. Insert the airvent needle into the airvent inlet. There should be a sound of air, and bubbles should appear in the solution; if this does not occur, discard the flask and obtain a new one.

NOTE

With some IV infusion sets, a vent needle is not required, In this situation, the bottle must be quickly inverted when the drip chamber is inserted in order to check the solution.

12. Remove the protective plastic seal from the tip of the drip chamber. Using moderate pressure and a twisting movement, insert the tip into the tubing inlet.
13. Place the control clamp below the drip chamber. Close the clamp.
14. Invert and suspend the flask on the IV standard, elevating it about 2 feet above the level of the bed.
15. Expel the air from the tubing: Hold the needle adaptor over the emesis basin, remove and save the protector cap, release the clamp, and allow solution to run freely through the tubing into the basin. Close the clamp and replace the needle protector cap. Loop the

needle end of the tubing over the flask until ready to start the venipuncture.

16. Assist with the venipuncture. The medical officer or individual authorized to start the infusion will select the site for venipuncture, apply the tourniquet, cleanse the skin, and instruct the patient. The assistant follows the operator's instruction and should be prepared to—
    a. Release the tourniquet on signal.
    b. Open the clamp and adjust the solution flow according to the orders.
    c. Assist with securing the needle in place. The operator may prop the needle in optimum position with a folded gauze square under its hub. The needle is then secured to the skin by using the three strips of prepared tape, placing two crossed over the needle's hub and one about 6 inches distal to the hub, looping the tubing slightly to avoid tension.
    d. Splint the arm loosely on the padded arm board to reduce movement. If the arm must be extended during the infusion, secure the board above the elbow and below the wrist with gauze ties. Take care not to tie the bandage so tightly that it will interfere with circulation. When the dorsal area of the wrist or hand is used for the infusion site, a short arm board is used to restrict wrist and hand movement, but not necessarily elbow movement. Flex the fingers over the end of the board.

NOTE

The IV tubing carton makes an excellent wrist and palm splint.

17. Record type and amount of fluid on I & O worksheet.
18. Record time started, by whom, site, type and amount of fluid, and rate of flow on DD Form 640 (Nursing Notes).

Care and Observation of the Patient During an Infusion

1. Know what position changes or movements are permissible. In general, the patient must lie quietly with no abrupt movement of the part of the body where the needle is inserted. Report immediately any suspicion of infiltration.
2. Watch for any signs of reactions. Take the pulse frequently. Watch the patient's color. Clamp the tubing and report immediately if the patient complains of feeling chilly or if shivering occurs.
3. Watch the drip regulator, counting the required number of drops to maintain the required milliliter flow per minute. Report if fluid stops flowing into the drip chamber or if required rate of flow is not maintained. If so instructed, adjust clamp to regulate flow.
4. Notify the responsible individual when the level of solution approaches the inlet of the bottle's neck. Do not change bottles or discontinue treatment by removing the needle unless specifically authorized to do so.

Changing Solution Bottle for Continuing Infusion

1. If authorized to change the solution bottle, prepare to do so when the level of the solution in use is in the neck of the draining bottle. Clamp the tubing to insure that no air enters the tubing in use. This tubing will be inserted into the new bottle.
2. Check the order and the label of the replacement bottle.
3. Wash hands.
4. Obtain a sterile airvent needle (size 18) from the IV tray p.r.n.
5. Remove the seal from the replacement bottle. Insert the airvent needle. Place this bottle on the table.
6. Check again to insure tubing in use is clamped off.
7. While the bottle to be replaced is still inverted on the standard, hold this bottle steady and remove the drip insert, holding the tip of the drip insert upright and elevated, being careful not to contaminate the tip. Remove the discontinued bottle from the hook.
8. Place the new bottle on a firm base; insert the drip chamber into the tubing outlet of the new bottle. If no needle vent is required, quickly invert the bottle to be sure it is safe to use. (Because the tubing is clamped, no air will enter the system.)
9. Hang the new bottle on the hook.
10. Open the tubing clamp and observe closely for resumed flow of solution. Check the drip chamber and the connector tip that is inserted into the IV needle.
11. Adjust clamp to required drip flow.
12. Check the needle site.
13. Stay with patient and observe the newly at-

tached bottle closely for continuing flow and drip rate. Also observe the patient's reaction for at least 5 minutes.

14. Record the amount received and the new unit started on the I & O worksheet and in Nursing Notes, following local directions for making the entry.

Discontinuing IV Infusion

1. If authorized to discontinue an infusion, prepare to do so when the level of the solution is in the neck of the last bottle to be given.
2. Clamp the tubing. Carefully remove the adhesive tape from the hub of the needle and the tubing.
3. Place a dry, sterile gauze square over the site of the venipuncture.
4. Withdraw the needle and apply pressure over the site until any oozing stops.

NOTE

It may be necessary to apply a strip of adhesive to fasten the gauze over the site.

5. Use a solvent such as acetone or benzine to remove tape marks from the patient's skin p.r.n.
6. Adjust the patient's clothing and position. Make the patient comfortable.
7. Take all equipment to the workroom. Discard the tubing and disposable needles, following local directives.
8. Check and restock the IV tray. Clean the IV stand and return it to the proper storage area.
9. Record the time the infusion was completed, the solution administered, the amount received, and any reaction noted in Nursing Notes.

5-62. Assisting With Blood Transfusion

Blood transfusion is the transfer of whole blood from one individual (the donor) to another (the recipient). The usual procedure is indirect transfusion by means of an intravenous infusion of blood that has been obtained from the blood bank section of the hospital laboratory.

NOTE

Intra-arterial technique for blood transfusion may be used by the doctor as an emergency resuscitation measure.

Every individual concerned with blood transfusion must be aware of precautions to be followed from the time the blood is requisitioned by the doctor to the followup observations of the transfused patient.

a. Requisitioning of Blood. Requests for blood are submitted on SF 518 (Blood Transfusion). Except in emergencies, requests are sent to the blood bank section of the laboratory the day before the transfusion is to be given. Requests in triplicate for each 500 ml. of blood required are initiated and signed by the medical officer. One copy is retained in the laboratory and two copies are returned to the ward with the requested unit of blood. Both of these copies remain with the blood pack unit at all times until the transfusion has been completed. The individual responsible for setting up the unit and administering the blood must compare information on the blood pack label with information on SF 518. After the transfusion, the medical officer completes all required entries; returns one copy, together with the used blood pack unit, to the laboratory, and files one copy in the patient's clinical record.

b. Identification of the Recipient. Proper identification of the patient to be transfused is of utmost importance. A specimen of the recipient's blood is identified by the person collecting this blood specimen and certification of this is made on SF 518 at the time of collection. The tube containing the blood must be identified with a firmly attached label. The recipient blood sample accompanies the requisition for blood; it is this sample that is crossmatched against available donor blood of corresponding type before the donor blood is released from the blood bank issue room to the using agency. Time must be allowed laboratory personnel for this essential step in identification. The minimal time required from the time the SF 518 is submitted until the time the blood is ready for release to the using agency is approximately 1½ hour.

c. Care of Blood Received by the Using Agency. The laboratory notifies the using agency when the required blood may be obtained. A standard plastic blood pack is used by military blood banks. This blood pack is refrigerated until issued; one unit at a time is released unless the medical officer has specified that two or more units are to be used simultaneously or in rapid sequence. Certain special precautions must be observed:

(1) A blood pack must be carried carefully: it must not be shaken or agitated in any way.

(2) Blood should be administered as it is obtained from the laboratory. If for some reason it cannot be administered, it should be returned immediately to the blood bank, providing it has not been unsealed. Blood should not be permitted to remain on a ward, unused, at room temperature.

(3) Storage of blood in refrigerators not directly under the supervision of blood bank personnel is not recommended; therefore, it is not good practice to place blood for future use in a ward service refrigerator. On ward units with a special requirement for having blood on hand, a special refrigerator is installed, and this refrigerator is monitored by blood bank personnel.

(4) Blood is not warmed before administration. EXCEPTION: It may be warmed for special cases such as for infants or debilitated patients.

d. Emergency Use of Group O Blood. Requisitioning and using group O, Rh negative, blood without regard for the recipient's grouping and typing (universal donor transfusions) is used as a lifesaving measure in conditions where there is massive hemorrhage with attendant shock. In these conditions, life is in immediate danger, and delay occasioned for purposes of typing and crossmatching would in all probability result in death. The chance of untoward reactions resulting from a group O transfusion is weighed against the immediate danger to life from hemorrhage and shock—this is a matter of medical judgment. Under combat conditions, group O blood has been administered to casualties without grouping or crossmatching. However, special precautions are followed. *For example,* when a patient has received a transfusion of group O blood in excess of 4 units and requires subsequent transfusion within a period of 2 weeks, he again receives group O blood, regardless of his heredity group. Even in these emergency situations when time is of vital importance, time must be taken to confirm that it is group O, Rh negative, blood being transfused. Blood bank personnel are responsible for the confirmation of grouping and typing of group O, Rh negative blood, for use in such an emergency before its release from the blood bank. Using agency personnel are responsible for (1) checking the information on the blood pack label to confirm that type O blood has been supplied before starting the transfusion and (2) for recording this information in the clinical record.

EQUIPMENT

Blood, as ordered, with SF 518 attached to the blood pack
Blood recipient set, disposable type[1]
IV tray[2]
Needle, size 18 or larger p.r.n.
IV standard

[1] The recipient set always has a filter chamber. Blood (or plasma) is never given with a set not designed for blood transfusion.

[2] For blood transfusion, a surgical skin preparation solution such as betadine may be specified instead of alcohol or other conventional antiseptics.

PROCEDURE

NOTE

The medical officer does the venipuncture, starts the transfusion and regulates the initial flow of blood. The medical specialist assists with preparation and observation of both the equipment and the patient receiving the transfusion.

1. Take and record the TPR.
2. If authorized to assemble recipient set (fig. 5–46) to the plastic blood pack, check the information on SF 518 with the information on the blood pack jointly with the medical officer before breaking the seal on the blood pack. Do not break seals and assemble the transfusion unit until all is in readiness for the venipuncture.

To Assemble Recipient Set to Plastic Blood Pack

(Steps are illustrated in figs. 5–47 and 5–48)

1. Mix the plasma and cells thoroughly by inverting the blood pack at least 12 times.
2. Loosen the cover on the inlet device of the recipient set but do not remove it. (To loosen the cover, push it in toward the flange (collar) of the coupler and twist it.)
3. Grasp the tabs of the outlet port on the blood pack, pull them apart, and fold them back to expose the sterile outlet tube.
4. Hold the blood pack with the thumb and forefinger over the folded tabs.
5. Remove the cover from the coupler and insert the spike end of the coupler into the outlet tube (fig. 5–47). Twist it all the way up to the collar, puncturing the plastic diaphragm of the port.
6. Fill the recipient tubing completely to the needle point with blood. (Manual pressure is used for this maneuver as no airvent is used with the plastic pack.)
   a. Place flow-control clamp loosely over the lower end of the plastic recipient tubing.
   b. Remove the needle adapter cover (push in and twist). If set does not include a needle,

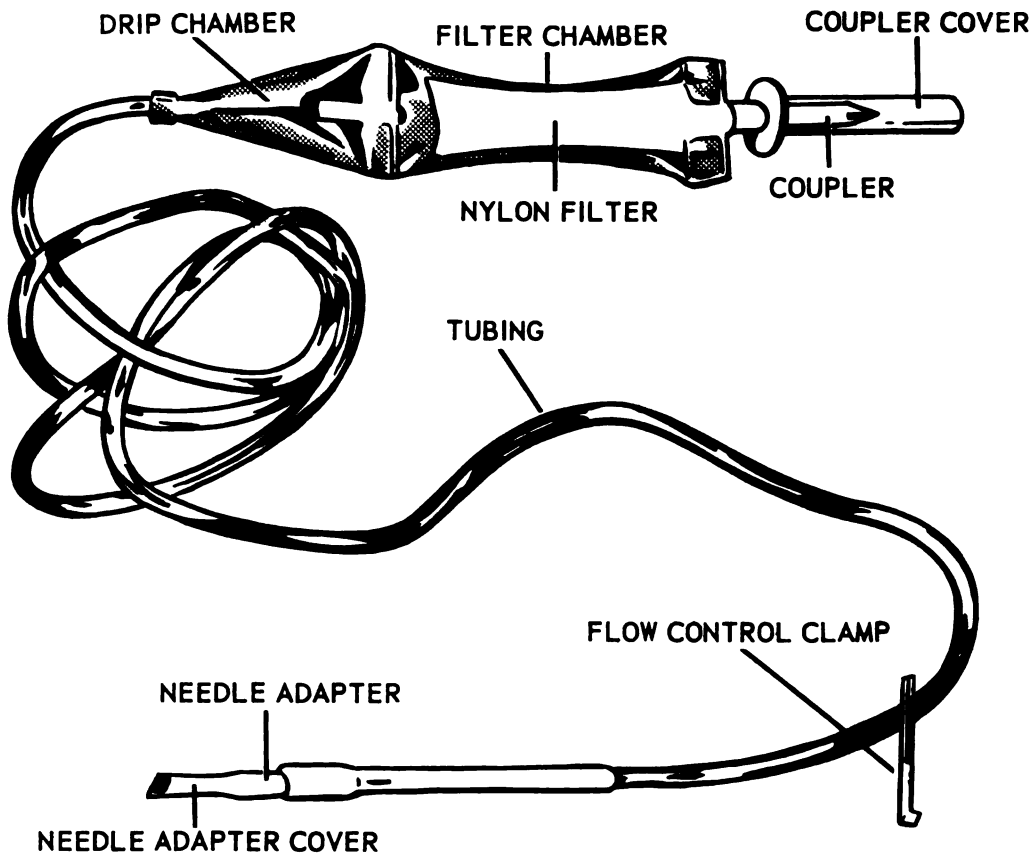


Figure 5–46. Blood recipient set.

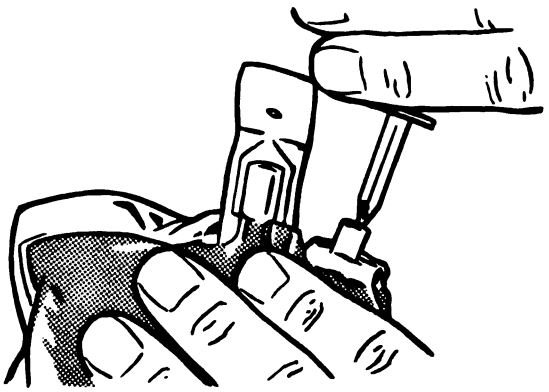


Figure 5–47. Inserting coupler into outlet tube.

place sterile needle of designated size on adapter.

CAUTION

Do not contaminate needle.

c. Hold the recipient set above the pack, with the needle adapter end above the drip chamber.
d. Squeeze the pack to fill the filter chamber with blood (fig. 5–48 Ⓕ).
e. Close the control clamp on the plastic tubing.
f. Suspend the pack on the IV standard in inverted position.
g. Lower the recipient tubing.
h. Squeeze the drip chamber, located below the filter chamber, gently to fill about ¼ with blood.
i. Release the flow-control clamp.
j. Fill tubing to needle point.
k. Reapply clamp. The set is now ready for use by the medical officer.

7. Assist with venipuncture procedure (para 5–60).
8. Remain with the patient. Constantly observe the rate of blood flow and watch for infiltration and for any signs of transfusion reaction.
9. Take and record TPR every hour for 4 hours.

Observations During Transfusion

1. *Rate of blood flow.* The medical officer regulates the initial blood flow and continues close observation of the patient and the blood flow. In general, blood is started at an initial slow

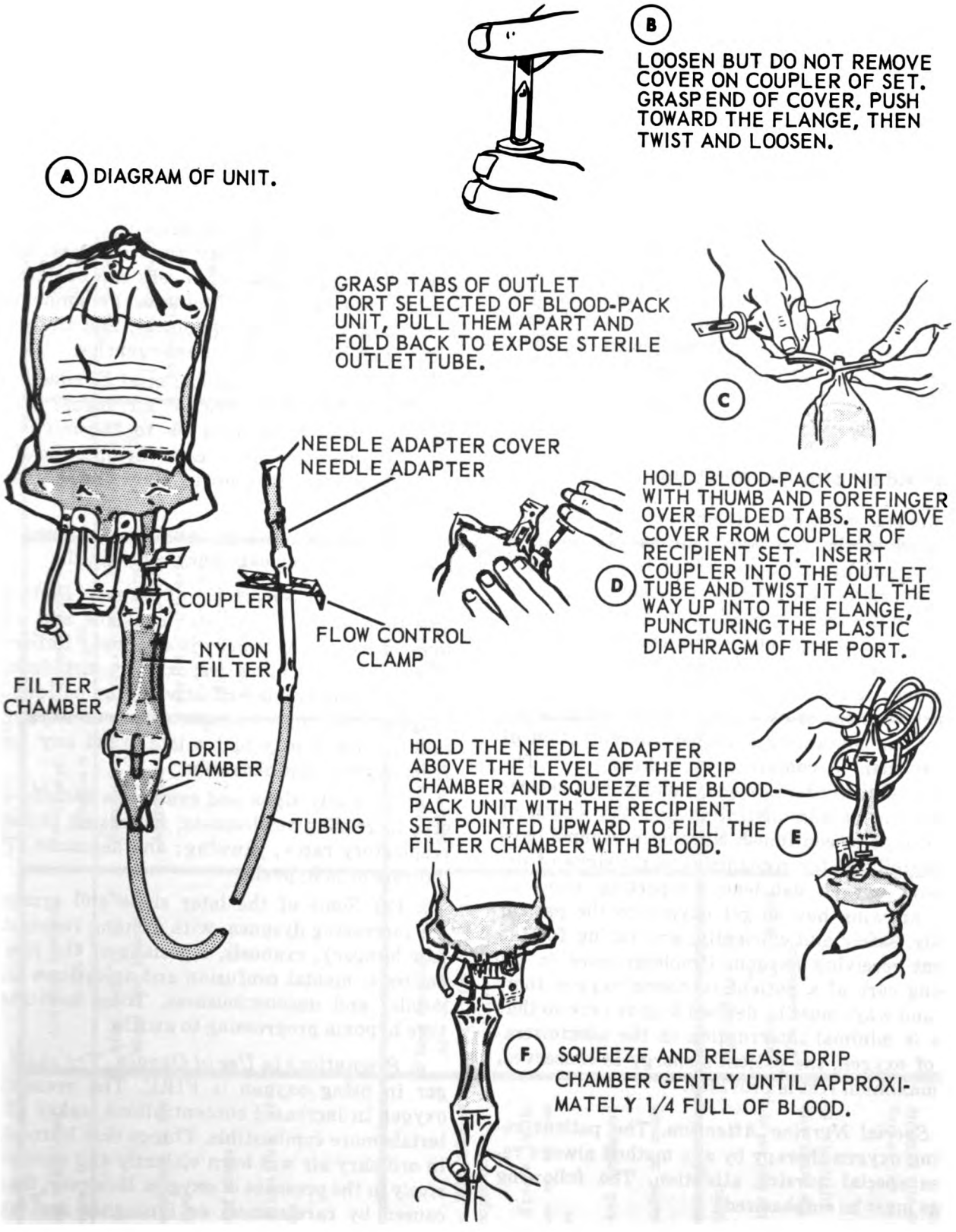

B
LOOSEN BUT DO NOT REMOVE COVER ON COUPLER OF SET. GRASP END OF COVER, PUSH TOWARD THE FLANGE, THEN TWIST AND LOOSEN.
A DIAGRAM OF UNIT.
GRASP TABS OF OUTLET PORT SELECTED OF BLOOD-PACK UNIT, PULL THEM APART AND FOLD BACK TO EXPOSE STERILE OUTLET TUBE.
C
NEEDLE ADAPTER COVER
NEEDLE ADAPTER
HOLD BLOOD-PACK UNIT WITH THUMB AND FOREFINGER OVER FOLDED TABS. REMOVE COVER FROM COUPLER OF RECIPIENT SET. INSERT COUPLER INTO THE OUTLET TUBE AND TWIST IT ALL THE WAY UP INTO THE FLANGE, PUNCTURING THE PLASTIC DIAPHRAGM OF THE PORT.
D
COUPLER
FLOW CONTROL CLAMP
NYLON FILTER
FILTER CHAMBER
DRIP CHAMBER
TUBING
HOLD THE NEEDLE ADAPTER ABOVE THE LEVEL OF THE DRIP CHAMBER AND SQUEEZE THE BLOOD-PACK UNIT WITH THE RECIPIENT SET POINTED UPWARD TO FILL THE FILTER CHAMBER WITH BLOOD.
E
F
SQUEEZE AND RELEASE DRIP CHAMBER GENTLY UNTIL APPROXIMATELY 1/4 FULL OF BLOOD.

Figure 5–48. Preparation of plastic unit for transfusion.

rate and increased after the first 20 minutes to finish the transfusion of 1 unit of blood in approximately 45 minutes. (In an emergency, blood can be administered very rapidly, at a rate of 50–75 ml. per minute.)

2. *Transfusion reactions.* There is a calculated risk with every blood transfusion, and there are complications which may cause undesirable or even fatal reactions. One of the most dreaded is the hemolytic reaction. Because hemolytic reaction is so serious and can occur after the transfusion of as little as 25 ml. of blood, a competent individual must observe the recipient constantly during the administration of blood and continue observations for several hours after transfusion is completed. The first rule to remember in any suspected reaction is: discontinue the transfusion. In general, the steps taken are summarized in table 5–3.

5–63. Administration of Oxygen

a. General. Oxygen is essential to life. It cannot be stored in the body, and the supply must be constant and in sufficient amount to sustain body cells. Normally, the 21-percent concentration of oxygen in inspired air is adequate for body needs. However, after any severe disturbance in the respiratory or circulatory systems, hypoxia (oxygen deficiency) can occur. Oxygen therapy is indicated in the treatment of hypoxia; it is the administration of air containing a higher concentration of oxygen than is contained in ordinary air. The medical officer orders oxygen therapy and decides the method of administration and the length of time it is to be continued. Nursing personnel have responsibilities for recognizing early signs of developing oxygen deficiency; reporting signs at once; knowing how to get oxygen to the patient quickly, safely and efficiently; and caring for the patient receiving oxygen. Problems arise in the nursing care of a patient receiving oxygen therapy, and ways must be devised to give care so that there is minimal interruption in the administration of oxygen, the patient's energy is conserved, and maximum rest is provided.

b. Special Nursing Attention. The patient requiring oxygen therapy by any method always requires special nursing attention. The following points must be emphasized:

(1) Regardless of the method used to administer oxygen, adequate explanation to the patient is desirable to allay his anxiety; the fearful, tense patient will not obtain maximum benefit from oxygen therapy. However, detailed explanations are inappropriate in an acute emergency; the best reassurance in such a situation is to have the personnel work efficiently and quietly with no confusion.

(2) The patient must have an open airway. The oxygen-enriched air administered in oxygen therapy must reach lung tissues. If the patient cannot breathe effectively, he needs respiration assistance as well as oxygen.

(3) When needed, oxygen-enriched air must be supplied quickly. Body tissues die when deprived of oxygen, and brain cells can be damaged beyond recovery in 3 to 7 minutes. Personnel must know how to use the equipment, and the equipment must be available for emergencies.

(4) The oxygen supplied must be adequate to be effective. Oxygen-enriched air should contain concentrations of at least 35- to 45-percent oxygen. To overcome even early symptoms of hypoxia, concentrations up to 100 percent may be necessary.

(5) Oxygen therapy must be continued until relief from oxygen deficiency is obtained.

c. Signs and Symptoms of Oxygen Deficiency. The time element in observing signs and symptoms of oxygen deficiency is extremely important. If early symptoms of hypoxia are not detected, reported, and treated effectively, the patient may progress to anoxia (complete lack of oxygen intake), when it may be too late to get any benefit from oxygen administration.

(1) Early signs and symptoms include anxiety; increasing restlessness; increasing pulse and respiratory rates; yawning; and headache. These indicate mild hypoxia.

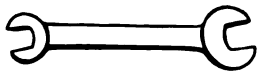
(2) Some of the later signs and symptoms are increasing dyspnea, with gasping respirations (air hunger); cyanosis, especially of the lips and nailbeds; mental confusion and agitation; dilated pupils; and unconsciousness. These indicate severe hypoxia progressing to anoxia.

d. Precautions in Use of Oxygen. The chief danger in using oxygen is FIRE. The presence of oxygen in increased concentrations makes all materials more combustible. Things that burn slowly in ordinary air will burn violently and even explosively in the presence of oxygen. However, fires are caused by carelessness or ignorance and should never occur. There is no reason to be afraid of using oxygen apparatus if the precautions in table 5–4 are taken.

Table 5-3. Transfusion Reactions

A If Reaction of Recipient (Patient) Is	B And Time Reaction Occurs Is	C Type of Reaction Is	D Probably Caused By	Rule Degree of Danger	Rule Do This	Rule Take To Laboratory
Severe chill Complains of pain in the lumbar region Complains of nausea Rapid elevation of temperature	After only 25 ml. of blood have been given	Hemoloytic (red blood cell) destruction	Transfusion of incompatible red cells; the donor erythrocytes are destroyed by antibodies present in the plasma of the recipient	Extremely serious, can be fatal	1. Stop the transfusion. 2. Tell the nurse or doctor immediately. 3. Treat for shock. 4. Notify lab service and take to the laboratory 5. Initiate an I & O record as recipient's kidneys may be damaged.	1. The unused blood and recipient set. 2. A 10 ml. specimen of venous blood from the recipient. 3. A post-transfusion urine specimen.
From: Mild chilliness with no temperature To: Severe chills, temperature up to over 103 degrees Flushed appearance Complains of severe headaches	Most frequently within 30 - 60 minutes after transfusion is completed	Pyrogenic (fever producing)	Contaminants introduced into blood or IV equipment	Serious	1. Stop the transfusion. 2. Tell the nurse or doctor immediately. 3. Treat for shock, if present.	
Urticaria (hives) Edema of the face and lips Edema of the larynx with serious difficulty in breathing May have wheezing respirations with difficulty in expiration	During transfusion or within 1 or 2 hours after completion	Allergic (hyper-sensivity)	Response by the recipient to allergic substances in the donor's blood	Serious	4. Notify lab service and take to the laboratory. 5. Initiate an I & O record as recipient's kidneys may be damaged.	

Table 5-4. Precautions in the Use of Oxygen

DO—	DO NOT—
Post "OXYGEN—NO SMOKING" signs on equipment, in storage areas, and at entrances to a ward or room where oxygen is in use, so that anyone approaching the area can see them.	• Do not use oxygen in the presence of any flame or spark. • Do not use electric devices which spark, such as signal buttons, razors, toothbrushes, heating pads, and hot plates. • Do not use oil or grease on any part of oxygen equipment. Do not adjust any equipment with greasy hands. (Oil or grease in contact with oxygen under pressure can ignite violently.)
Warn the patient and all visitors not to smoke. Remove all matches, cigarettes, and ash trays from the bedside cabinet. Search the patient's pajama pocket and bed linen to insure that he keeps no item listed above.	• Do not smoke.
Eliminate sources of static electricity: • Use cotton blankets. • Handle bed linen by lifting and placing carefully to eliminate friction. • Use cotton and cotton flannel pajamas for patients.	• Do not use wool blankets or bed clothing.
Use the standard open end gas cylinder wrench, nonsparking type, for cylinder attachments. 	• Do not use the familiar monkey wrench. It is considered hazardous.
Protect the cylinder valve with the cylinder cap when storing.	• Do not drop the cylinder. The weight is a hazard, and damage to the valve creates additional hazards.
Secure the heavy cylinder in an upright position to a stationary support with a strap; when transporting a cylinder, strap it to the carrier.	• Do not place cylinders next to steampipes or radiators. (External heat can cause excessive rise in the cylinder; although a safety valve releases pressure to prevent explosion, the sudden escape of oxygen into a confined space creates a hazardous atmosphere.)
Obtain full cylinders from the central controlled storage area.	• Do not store excess cylinders in the ward area.

e. Oxygen Supply. Oxygen is supplied in portable cylinders or from a piped oxygen system. Regardless of the source of supply an essential step in setting up equipment to administer oxygen is attaching the oxygen regulator. (Different models of regulators are used and the user must become familiar with those available, but each will have certain essential features.)

PORTABLE CYLINDER OXYGEN REGULATORS

Connecting the Cylinder Regulator

The regulator used for cylinder oxygen reduces the high pressure in the cylinder to a low pressure that is safe; it insures a steady, even flow of oxygen; and it provides a means for adjusting the rate of flow. The oxygen regulator (fig. 5–49) has two gages: the high pressure gage shows the amount of oxygen in the cylinder and is calibrated in pounds pressure (a full tank registers approximately 2200 pounds); the flowmeter gage shows the rate of oxygen flow and is calibrated in liters per minute.

Procedure

Step 1. Check the cylinder label and look for the green color code to insure it contains oxygen and not some other medical gas or compressed air. Unscrew and remove the heavy metal valve cap. "Crack the cylinder" by opening and quickly closing the cylinder valve wheel to blow out any dust from the cylinder outlet; stand to one side of the outlet, and be prepared for an alarming sound of gas escaping.

Step 2. Close the flow-adjusting valve of the regulator by turning the handle to loosen it. Insert the regulator inlet into the cylinder valve outlet, supporting the regulator in an upright position. Secure the nut by turning with the fingers and tightening with the wrench.

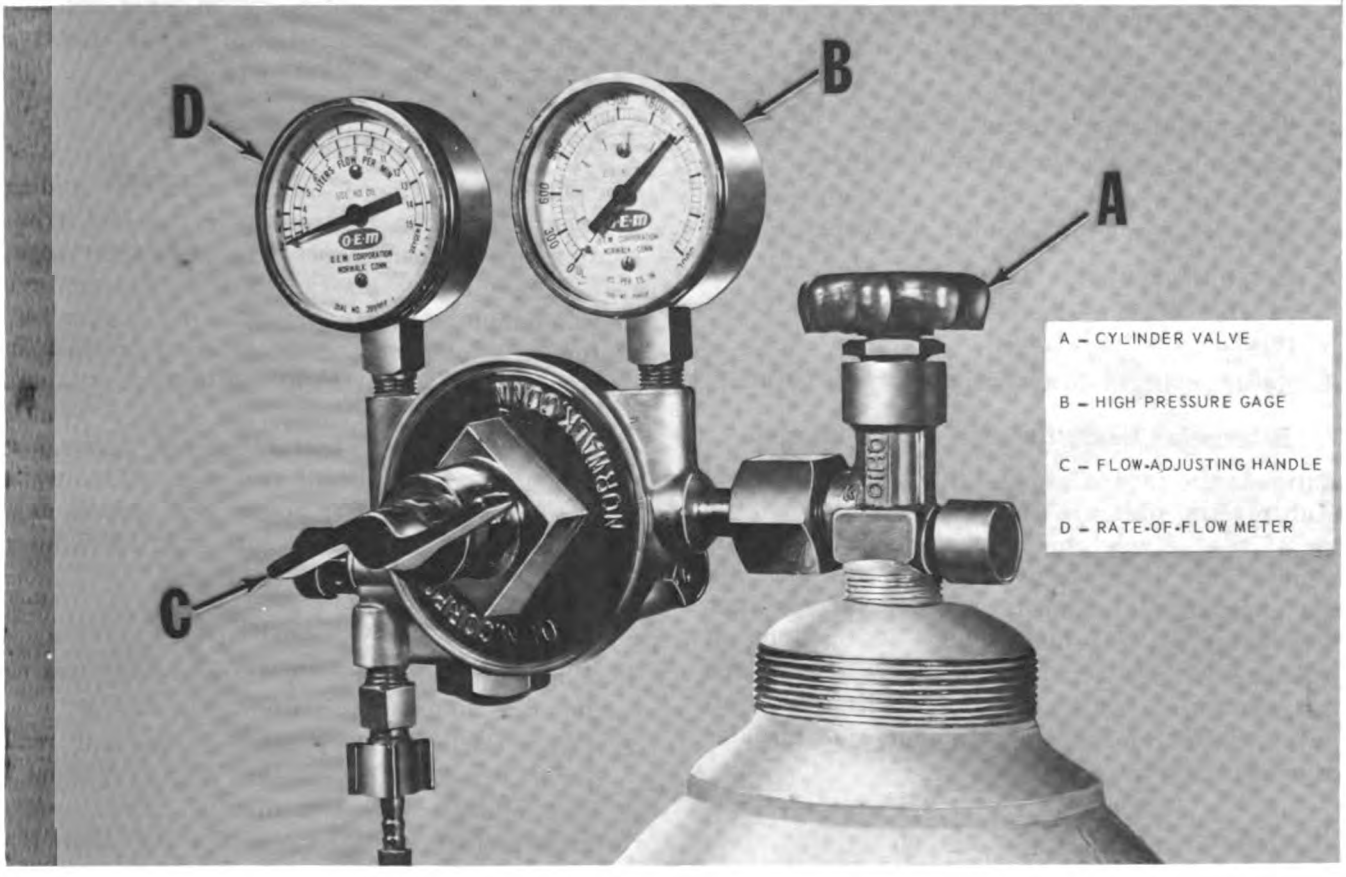
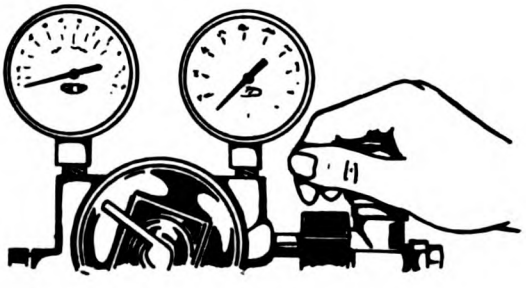


Figure 5–49. Oxygen cylinder with attachments.

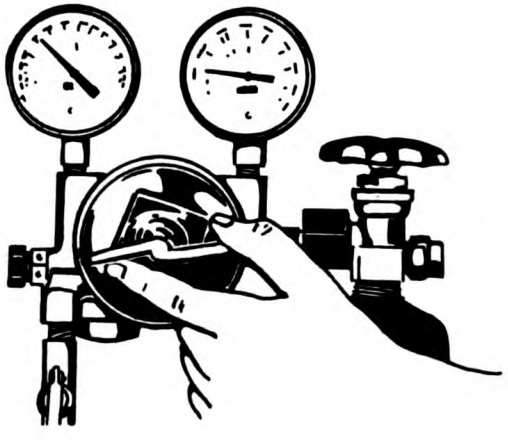
Step 3. Check to see if the flow-adjusting valve on the regulator is closed. Then open the cylinder valve wheel cautiously and very slowly. Watch the needle on the contents gage.

NOTE

If the gage registers less than 100 pounds pressure, plan to replace the cylinder. Label the rejected cylinder "Empty."



Step 4. Turn the flow-adjusting valve handle to tighten, and open it to the desired rate of flow in liters per minute.



Disconnecting the Cylinder Regulator

1. Note contents remaining in the cylinder by reading the contents gage. Write this on a piece of adhesive tape, with time and date.

NOTE

If contents are 100 pounds or less, consider the cylinder empty, and so label it.

2. Stick the tape on the cylinder in a prominent spot before detaching the regulator.
3. Close the cylinder valve.
4. Wait until both gages register zero.
5. Loosen the flow-adjusting valve handle.
6. With the wrench, loosen the inlet nut and remove the regulator from the cylinder.
7. Recap the cylinder, taking care when screwing on the heavy cap not to cross the screw threads. Use both hands.
8. Return cylinder to authorized storage point.

Estimating Usage Rate of Cylinder Oxygen

Estimate the rate of use by the following method: Multiply the pressure remaining in the cylinder by 3; then divide the number obtained by the number of liters being administered to find the approximate number of minutes of oxygen flow available. *EXAMPLE:* If 300 pounds of pressure are registered on the contents gage and oxygen is being administered at 10 liters per minute, what is the approximate number of minutes of oxygen flow available?

$$\begin{array}{r} 300 \times 3 = 900 \\ \hline 10 \end{array} \quad \begin{array}{l} 900 = 90 \end{array}$$

ANSWER: 90 minutes usage remains at 10 liters per minute.

PIPED OUTLET OXYGEN REGULATOR

The regulator used for a piped oxygen system is a flowmeter; pressure-reducing regulators are not required and the flowmeter has only one gage. The flowmeter is plugged into a wall outlet valve when oxygen is to be administered. To attach the flowmeter, follow the procedure outlined at the local station. Each system has distinctive features, but most require the removal of a dust plug and the use of an outlet key. Areas equipped with piped oxygen should also have a cylinder set up on a carrier to transport oxygen in an emergency to a patient located distant from available outlets.

1. *Emergency shutoff valve.* Each ward or clinic area where piped oxygen is distributed has an emergency shutoff valve to be used in case of fire or major leaks in the outlet valves. A valve key is kept in a prominent and accessible place. You must know how to use the valve key and the emergency shutoff valve.
2. *Visual alarm system.* A red-light signal flashes on if the oxygen pressure in the main supply line drops. If this occurs, turn off all outlets and substitute cylinder oxygen when continuous therapy is required. Notify the appropriate maintenance section by phone.

5-64. Use of Humidifiers

The humidifier (fig. 5-50) is used for adding moisture to oxygen, to prevent drying and irritation of mucous membranes. The humidifier apparatus is a glass or plastic jar with a screw cap and an adapter for attachment to the oxygen regulator or flowmeter. Humidifiers supplied in Army Medical Department equipment sets are called "Insufflator, oxygen, nasal." If a 2-bottle insufflator is used, the bottle attached to the oxygen regulator is filled half full with water while the second bottle is left empty and serves as a trap for excess moisture. A tube called a diffuser bubbles the oxygen through the water.

PROCEDURE

1. Fill the humidifier only to the water line or no more than half full if no line is visible.
2. Check the water level when in use and refill p.r.n. The diffuser tube should extend about 1 inch under water. Use distilled water unless manufacturer's directions specify that tap water can be used.
3. Always use a humidifier with a nasal catheter.

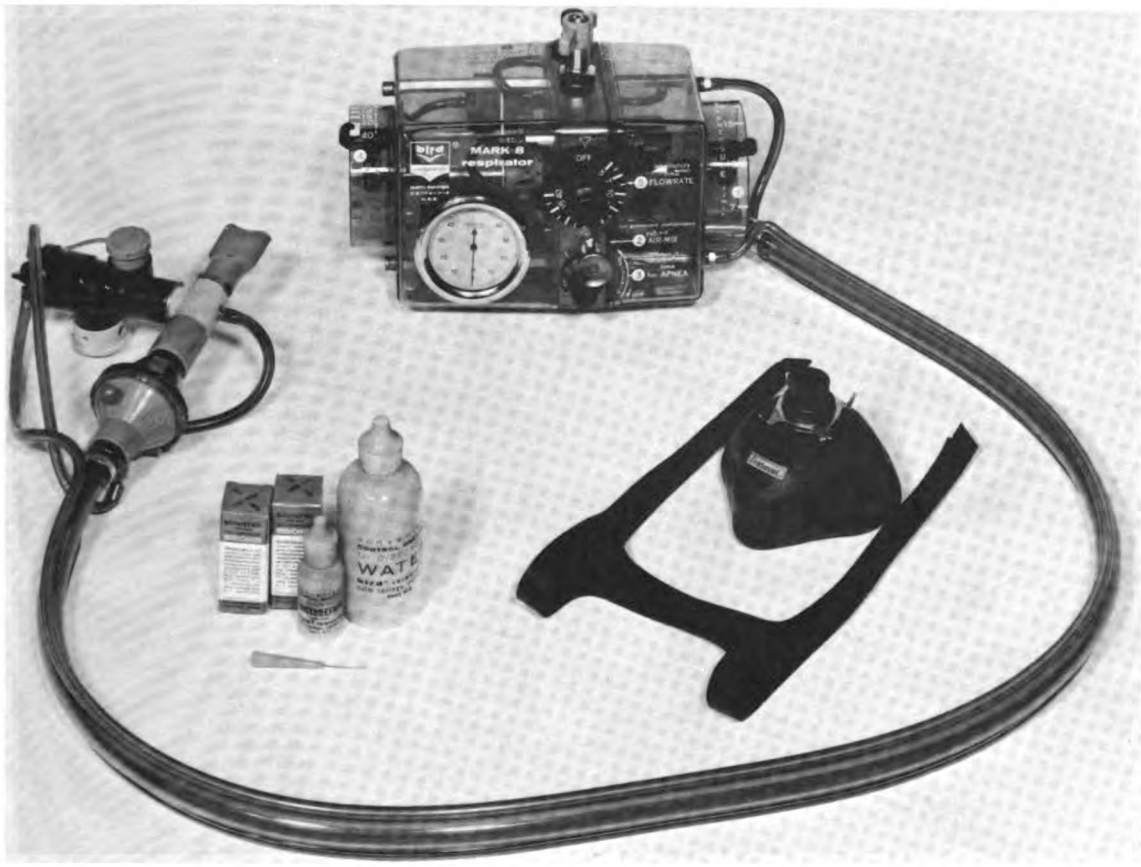
NOTE

Humidifiers may be used with masks when high concentrations are continued for several hours. Ordinarily, enough moisture remains in the mask to humidify oxygen given in concentrations of less than 70 percent (obtained with an oxygen flow of 3 to 4 liters per minute, providing the mask fits properly).

4. After use, disconnect the humidifier.
5. Wash and sanitize the component parts, following manufacturer's instructions.
6. Refill half full with fresh water. Proper care of the humidifier will prevent corrosion of the metal parts, as well as being a safety factor for the patient.

5-65. Administration of Oxygen by Face Mask

Several kinds of masks are in common use. The type discussed is included as a component part of the inhalator set authorized in Army Medical Department equipment lists. The nasal mask fits over the patient's nose and permits him to eat,



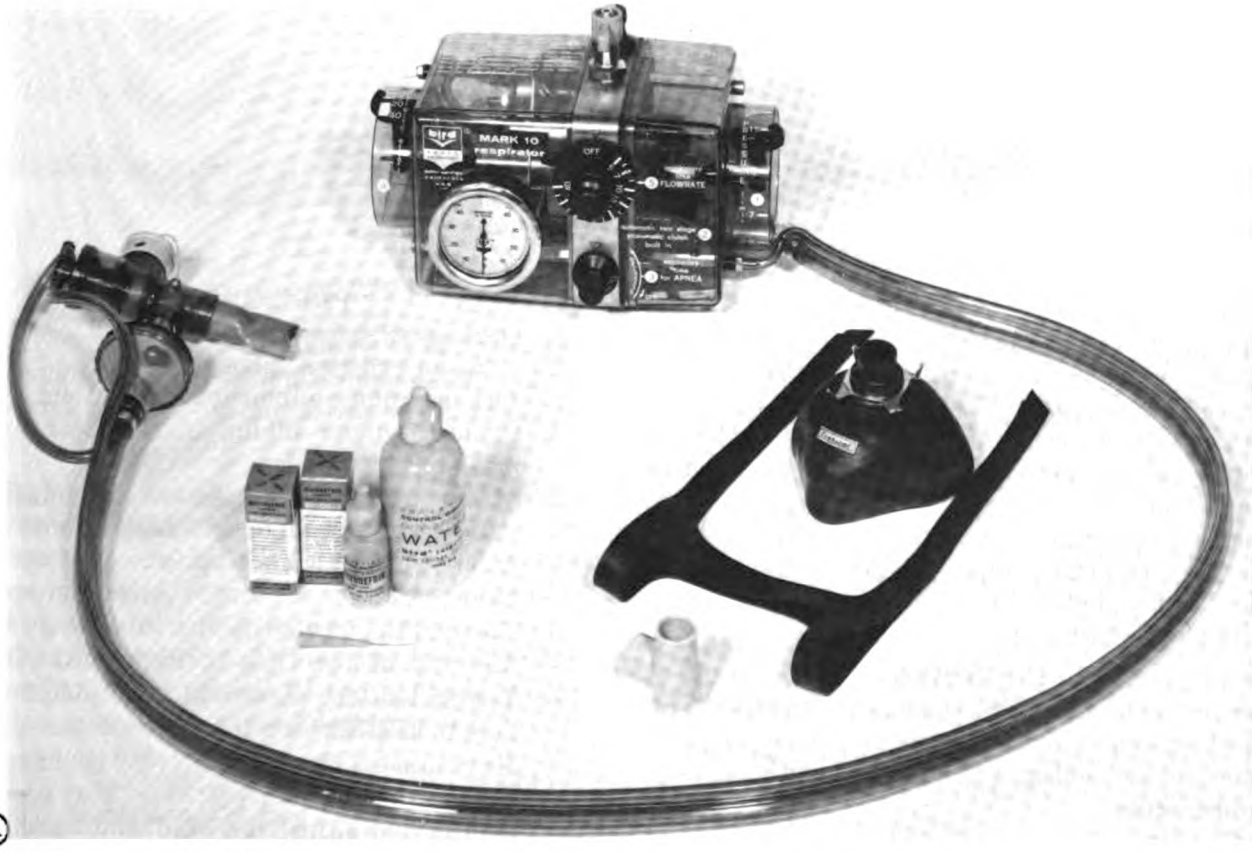


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Figure 5–50. Respirator with nebulizer.

Figure 5–50—Continued.

drink, and talk while receiving oxygen; it is not appropriate for unconscious patients or those who cannot cooperate and keep their mouths closed to control air dilution. The oronasal mask covers both nose and mouth and is the type most commonly used in emergency situations because high concentrations of oxygen can be delivered rapidly. The oronasal mask illustrated in figure 5–51 is a partial rebreathing type. Oxygen flows into the bag, and exhaled air is partially discharged through the flutter valve in the facepiece.

EQUIPMENT

Oxygen cylinder with regulator connected (or piped oxygen with flowmeter)
Latex rubber tubing, 4 to 5 feet in length
Rubber band
Safety pin
Open end wrench

PROCEDURE

1. Observe all safety precautions (table 5–4).
2. Turn on cylinder valve to check contents before bringing equipment to the patient.
3. Connect rubber tubing to regulator and to mask tubing adaptor.
4. Strap the cylinder to the bedpost, placing it away from a radiator. If used on a cylinder carrier, place it in an upright position away from a radiator.
5. Turn on the flow-adjusting valve to an initial high rate of flow (8 to 12 liters a minute).
6. Tell patient the mask will be adjusted to his face to help him breathe more easily.
7. Have him exhale while applying the mask.
8. Fit the mask securely over his nose and mouth, and adjust the headband snugly, but not tightly, passing it just above his ears.

Figure 5–51. Administration of oxygen by face mask.

Adjust the fit so that there is no apparent leakage of air. Slightly dampened cotton strips may be placed at the mask edges to obtain a proper fit.

9. Stay with him, encouraging regular inhalation and exhalation. Observe him. Watch the expression in his eyes. As he appears less apprehensive, reduce the liter flow to the prescribed rate, usually 6 to 8 liters per minute. The pulse rate should be slower and of better quality, and cyanosis of the nailbeds should disappear as the oxygen deficiency is relieved.
10. Watch the breathing bag. Toward the end of each inhalation, the bag should deflate; with each exhalation, the bag should expand. For oxygen concentrations of 90 to 95 percent, adjust the liter flow at a sufficiently high rate (8 to 10 liters per minute) so that the bag never collapses completely even at the maximum depth of inspiration.
11. Loop the elastic band around the tubing, and pin the loop to the foundation bedsheet. Be sure the tubing is long enough to allow the patient to move about without tension on the tubing. Check to make sure the tubing is not pinched or kinked.

CONTINUING CARE OF THE PATIENT

1. Continue close observation of the patient and the equipment.

NOTE

It may be necessary to remain with the patient constantly.

2. At least every 2 hours, remove the mask (unless contraindicated) and wash and dry the patient's face.
3. Offer fluids, if permitted. Give mouth care.
4. Dry the interior of the mask. Apply powder, if used, very lightly to the patient's face and reapply the mask.

CARE OF THE MASK AFTER USE

1. Wash the mask and rebreathing bag, disconnecting the parts.
2. Rinse in prescribed antiseptic solution and air dry.
3. If kept on the ward, place the clean, reassembled mask in a labeled paper bag.
4. Staple the bag shut and return it to the prescribed storage area.

5–66. Administration of Oxygen by Nasal Catheter

Oxygen administered by nasal catheter is used when the concentration required is less than 50 percent. A disadvantage is that the catheter irritates the nasal mucous membranes, although the patient may tolerate a catheter better than a snugly fitted mask. The oxygen catheter is made of thin-walled latex or plastic, with a rounded tip and multiple perforations near the tip. Sizes vary from 8 to 14; a size 12 or 14 is suitable for an adult, the criteria being to select the largest size that can be inserted comfortably into a nostril. The humidifier is always used with nasal oxygen since the catheter directs oxygen flow to the oropharynx and bypasses the normal moistening action of the nasal mucous membrane.

EQUIPMENT

Oxygen cylinder with regulator connected (or piped oxygen with flowmeter connected)
Humidifier, half full of clean water
Rubber tubing, 4 to 5 feet
Glass of water
Tongue depressor
Flashlight
Paper tissues
Lubricant (check with the medical officer on choice of lubricant)
Adhesive tape, ½ inch wide
Rubber band
Safety pin
Open end wrench

PROCEDURE

1. Observe all safety precautions (table 5–4).
2. Check oxygen regulator attachment. Turn on cylinder valve to check oxygen content. Do this before bringing equipment to patient. Leave this valve on.
3. Attach humidifier to regulator.
4. Attach tubing to humidifier outlet.
5. Secure cylinder to bedpost with a strap, placing it away from the radiator, or place the cylinder carrier in an upright position, away from the radiator.
6. Select the appropriate size catheter. To determine the approximate distance for insertion in the oropharynx, measure the distance from the lobe of the patient's ear to the tip of his nose with the catheter, and mark this point on the catheter with a small piece of adhesive.
7. Connect the oxygen tubing from the humidifier to the catheter.
8. Lubricate the catheter sparingly, using recommended lubricant (water soluble) and a tissue.
9. Open the flow valve and set the oxygen flow rate at 3 liters per minute.
10. Hold the perforated end of the catheter in the glass of water for a few seconds and observe bubble flow to be sure perforations are not plugged with lubricant.
11. Hold the catheter at the tape mark, and rotate it to find the droop of the catheter.
12. With oxygen flowing at a low rate and catheter in position of lowest droop, insert the catheter into the patient's nostril. Elevate the tip of the nose, and pass the catheter slowly along the floor of the nasal cavity to the tape mark (fig. 5–52 Ⓐ). The patient will usually swallow at this point.
13. Using tongue blade and flashlight, inspect the patient's oropharynx. The tip of the catheter should be approximately at the tip of the patient's uvula (fig. 5–52 Ⓑ). At the proper level, the patient should not be swallowing continuously; if he does so, withdraw the catheter slightly to relieve this reflex.
14. Tape the catheter in place. Use a 3-inch strip of ½-inch adhesive, split halfway up its length; wrap one narrow split end around the catheter and anchor the two free ends to the patient's nose or face. There should be no pressure of the catheter against the nostril or

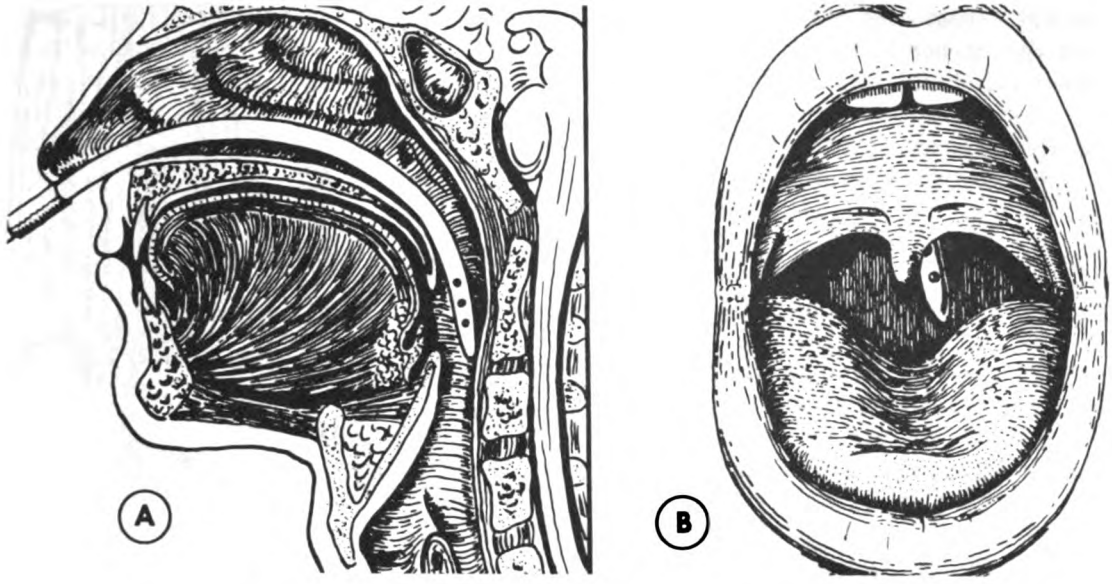


Figure 5–52. Administering oxygen by nasal catheter.

nasal septum. Tape the catheter again to the side of the face near the top of the ear.

NOTE

Avoid sticking adhesive on bearded area.

15. Loop the elastic band around the tubing and pin it to the bed. Allow enough slack for free movement, with no tension on the catheter. Check to see that the tubing is not kinked.
16. Regulate the oxygen flow to the prescribed rate. Below is an approximation of oxygen concentration by oropharyngeal catheter:

Flow (liter)	*Approximate concentration*
4–5	30 percent
6–7	40 percent
8–9	50 percent

CONTINUING PATIENT CARE

1. Watch for signs of relief from hypoxia. If patient continues to be restless and dyspneic, report this stat. Check oxygen flow and position of catheter. Make sure tubing is not pinched or kinked.
2. Watch particularly for excessive swallowing —the patient's stomach can become greatly distended from swallowing air and oxygen, and if this occurs oxygen therapy by catheter is discontinued.
3. Give oral and nasal hygiene care every 2 hours.
4. Give fluids frequently, if permitted.

NOTE

The medical officer may order nasal oxygen discontinued while food and fluids are swallowed.

5. Change the catheter at least every 12 hours or more frequently if nasal secretions make it necessary. Use alternate nostril each time the catheter is changed. Remove all adhesive marks from the patient's skin with a solvent such as acetone, and wash off the solvent with warm water.
6. Remove tape and tape marks from latex catheters; flush through with cold water and return to CMS. Discard used plastic catheters.

5–67. Administration of Oxygen by Tent

The oxygen tent unit in common use for adults consists of an electrically operated cooling and air-oxygen circulation unit and a plastic canopy. The most important advantage of the tent method is the comfort provided the patient, who is encouraged to relax and rest in the cool humidified atmosphere within the tent. The chief disadvantages of the tent method are the difficulty in maintaining the prescribed concentration of oxygen and the dependency upon electricity for the motor unit. Oxygen concentrations up to 55 percent can be maintained, providing all procedures are followed carefully and the motor unit operates satisfactorily.

CAUTION

If the electricity fails, remove

the patient from the tent immediately, as the carbon dioxide, heat, and humidity levels build up rapidly within the tent when the blower unit is not operating. Be prepared to substitute mask or catheter oxygen administration p.r.n.

EQUIPMENT

Oxygen cylinder with regulator connected (or piped oxygen with flowmeter connected)
Oxygen tent unit—cabinet and canopy
Extension cord, heavy duty type p.r.n.
Wall thermometer (for inside of tent)
Tap bell
Cotton sheet, folded in fourths, lengthwise
Open end wrench
Oxygen analyzer

PROCEDURE

1. Observe all safety precautions (table 5–4).
2. Check oxygen cylinder pressure gage. Start with a full cylinder.
3. Bring cylinder to patient unit, securing it to head of the bed on the side opposite the bedside cabinet.

NOTE

Move the bed away from walls p.r.n. to allow placement of the tent unit adjacent to the cylinder and free access to all four sides of the bed at all times.

4. Check to be sure that the bed has a plastic mattress protector; if not, cover the top half of the bed with a rubber sheet placed between the mattress and the foundation sheet. This measure reduces seepage of oxygen through the air spaces of the mattress and facilitates maintenance of required concentration within the canopy.
5. Position the patient comfortably, preferably in a low Fowler's position.
6. Check the motor unit and canopy assembly (fig. 5–53) outside the patient's unit:

- Plug in the motor unit cord. Turn on the switch. Adjust the temperature control and air circulation control. Hold hand over blower sleeve to test air circulation.
- Set air circulation usually at medium and temperature control usually at 70 degrees. In very hot weather, however, it is not advisable to set the temperature control more than 10 degrees below room temperature in order to avoid excessive frost from building up on the cooling coil and overheating the motor.

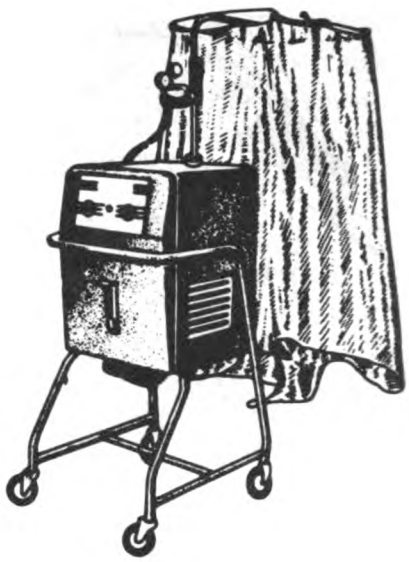


Figure 5–53. Oxygen tent with plastic hood.

- Extend the canopy arm and unfold the canopy. Check the overhead brace, the attachment to the blower sleeve, and the canopy for any pinholes or tears. If necessary, mend any breaks in the canopy with plastic tape.
- Check the cooling coil drip pan and empty p.r.n.

7. Bring the tent unit to the bedside. Position the cabinet adjacent to the bed with the canopy arm assembly extending over the patient from head to waist level.
8. Connect oxygen supply tubing to tent inlet. Plug in the cord; turn on the switch. Turn oxygen flow to an initial level of 15 liters per minute.
9. Arrange the canopy over the patient, holding it high to avoid dragging it over his face. Tuck the canopy well under the head of the mattress. Direct the inflow sleeve so that it will not blow directly on the patient's face, head, and neck and make sure it is not obstructed by anything.

- Bring the front of the canopy to waist level, over the bedding. Secure the canopy edge between folds of the extra sheet, molding the folds over the patient's body. The folded sheet closure helps contain the oxygen in the upper part of the tent.
- Tuck the canopy sheet folds well under at both sides of the bed. Tuck the other bed clothing under snugly, but not so tightly that arm and leg movements are restricted.

10. Adjust the patient's postion to insure maximum comfort. Place a box of tissues, a paper bag, and a tap bell within his reach, inside the canopy.

11. Hang the wall thermometer within the tent at head level so that it can be easily read from outside the tent. Maintain the desired temperature in the interior of the tent by adjusting the temperature dial on the motor unit.

NOTE

A cool atmosphere is usually recommended, but use bath towels for head and shoulder wraps p.r.n. if the patient feels chilly.

12. Check to be sure all zippers are closed and all connections are secure.
13. Continue oxygen flow at 15 liters for 30 minutes to build up required concentration. If the regulator used with the tent has a flush valve, flood the interior with oxygen by holding the valve open for 2 minutes. Warn the patient that there will be a rushing noise when this is done.
14. Thirty minutes after installing the patient in the tent, determine the oxygen concentration with an oxygen analyzer. Do this before reducing the flow of oxygen to the prescribed level. As a rule, when the patient is resting and the tent is not opened, a minimum of 10 liters per minute is required to maintain a *50-percent oxygen concentration.*

USING AN OXYGEN ANALYZER

The analyzer is an apparatus used to determine the oxygen concentration in the air circulating within the tent canopy. The use of an analyzer is the only way to insure adequate oxygen therapy by the tent method. A Beckman analyzer (fig. 5–54) is a standard item. Although simple to operate, it is an expensive, precision instrument and must be used exactly as the manufacturer directs. It is usually stored in a central area such as CMS and is obtained, as required, by the using unit.

- The tent unit is equipped with a connection nipple on the oxygen-air intake elbow. This connection must always be closed off except when connected to the analyzer.
- If there is continued difficulty in maintaining the required concentration and all leakage points have been checked, consideration should be given to reducing the space within the canopy. There should be just enough space around the patient to keep him from experiencing claustrophobia (fear of inclosure). In a small space, less oxygen is needed to maintain the required percentage concentration.

CARING FOR THE PATIENT IN THE TENT

CAUTION

Consolidate care to be given at one time so that the canopy is opened as infrequently as possible and then only as wide as is absolutely necessary. Remember, the canopy is not soundproof. The patient can hear conversation and noise, and both interfere with needed rest.

Figure 5–54. The Beckman oxygen analyzer.

1. Use the zipper openings in the canopy to hand food or drink to the patient, to bathe his face, or to give oral hygiene.
2. When bathing the patient and making the bed, draw the canopy up around his neck and tuck the free sides under the pillow.

NOTE

In some hospitals the procedure is to remove the tent and substitute mask or catheter therapy during this period.

3. Give care in progressive steps when conservation of the patient's energy is a major consideration. For example, give a partial bath, allow a rest period, and then change the bed linen. The patient may not be able to tolerate a complete bed bath and linen change on a daily basis.
4. Take temperature by rectum when the patient is in the tent.
5. Check the wall thermometer inside the tent at regular intervals. Maintain it at the desired level by changing the temperature control.

CAUTION

Adjust this control only when the motor is running.

6. Use the oxygen analyzer at prescribed intervals, usually every 3 or 4 hours, and always 30 minutes after replacing the tent following a major care procedure.
7. When oxygen therapy is discontinued, taper off the treatment by removing the patient from the tent for short intervals of about 15 to 20 minutes. If his pulse and respiratory rates do not increase and his lips and nailbeds do not become cyanosed, lengthen the intervals.

CAUTION

Never taper off treatment by decreasing the amount of oxygen into the tent, as carbon dioxide would build up rapidly. The canopy may be loosened, however, to create leakage deliberately. If this is done, be sure personnel are aware of the reason for the loosening; otherwise, the immediate reaction will be to tuck it in securely.

CARING FOR EQUIPMENT AFTER USE

If entire unit is not returned to CMS, follow these steps on the ward:

1. If canopy is to be reused, wash, rinse, and hang it to air dry.
2. Wipe off the cabinet and all fittings with prescribed germicide.
3. Drain and dry the drip pan to prevent rust.
4. Return the unit to a central storage area.

5–68. Intermittent Positive Pressure Breathing Apparatus

a. The intermittent positive pressure breathing (IPPB) apparatus is used to assist breathing in many acute and chronic pulmonary conditions. Its use is prescribed by the doctor when the patient must be assisted to breathe more effectively; to introduce prescribed broncho dilating, mucolytic (mucus liquefying), or antibiotic drugs into lung tissues (aerosol therapy); and to promote bronchial drainage. In IPPB treatment, respiration is induced by mild positive pressure to inflate the lungs during inspriation, followed by passive expiration. A special valve in the apparatus controls the intermittent inhalation positive pressure and the release of pressure for exhalation; the cycling of the valve is controlled by the patient's respiratory rate and rhythm. When an IPPB apparatus is used for emergency resuscitation in respiratory failure, the valve must be adjusted manually for automatic cycling.

b. Several types of IPPB apparatus are in common use in many Army Medical Department hospitals, but no one type is a standard item. Some models, such as the ones illustrated (figs. 5–55 and 5–56), are pedestal or mobile units for attachment to a wall outlet; others are cylinder-mounted (attached to an oxygen cylinder). Figure 5–57 shows other IPPB apparatus (Bird).

c. Although compressed oxygen is usually used in operating an IPPB unit, some units operate with an air compressor unit or a compressed air cylinder; this method of operation is prescribed by the doctor when oxygen therapy is not advisable. Local nursing procedure manuals must be consulted for operation of the unit in use; local policy determines the training and supervisory requirements for personnel authorized to use the equipment. An illustrated comprehensive instruction manual for the type of apparatus in use is provided by the manufacturer and must be consulted.

5–69. Pharyngeal Suctioning (to Clear Airway)

The throat, mouth, or nose is suctioned to remove

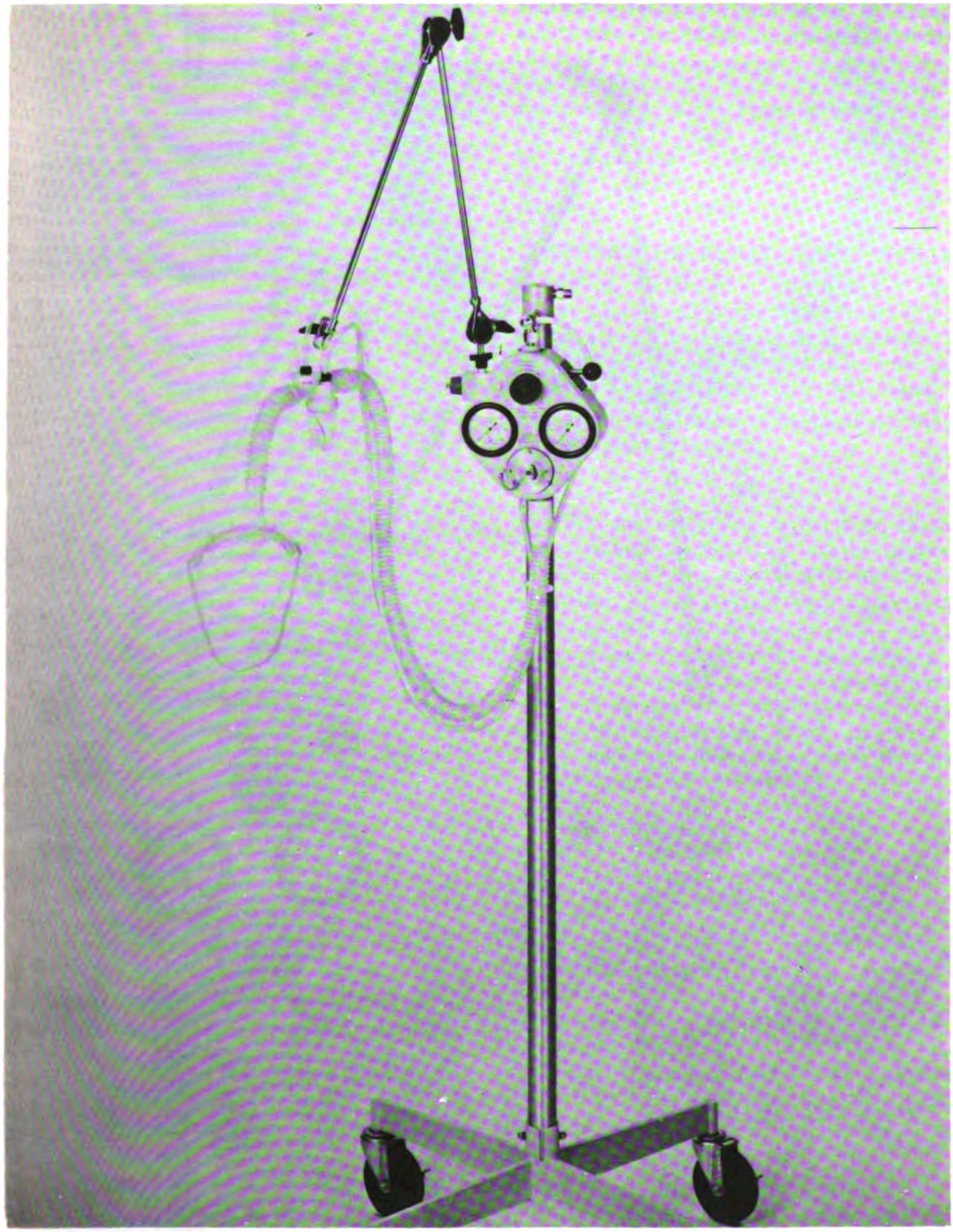


Figure 5–55. Intermittent positive pressure (Bennett valve PV–3P) apparatus.

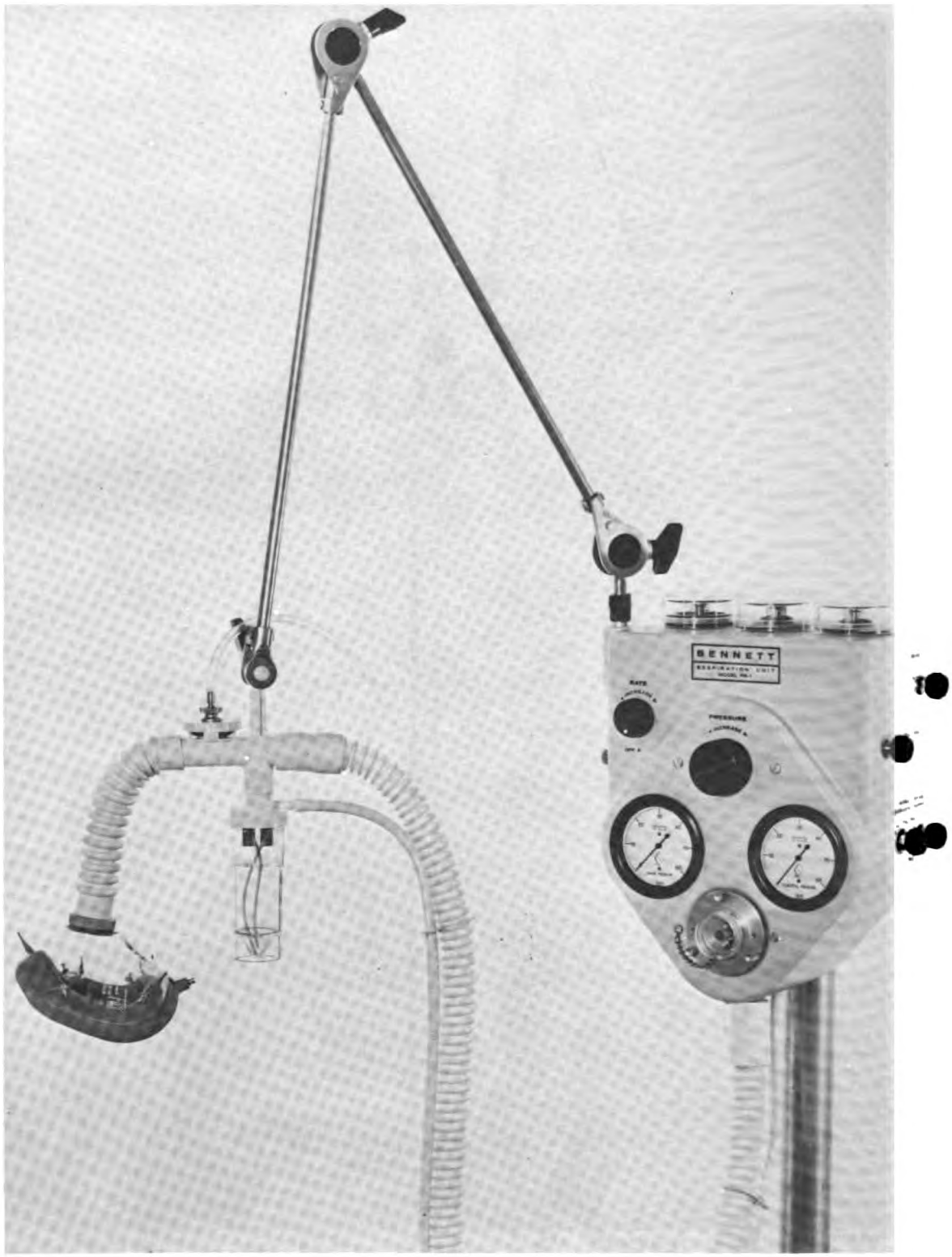


Figure 5–56. Intermittent positive pressure (Bennett valve PR–1) apparatus.

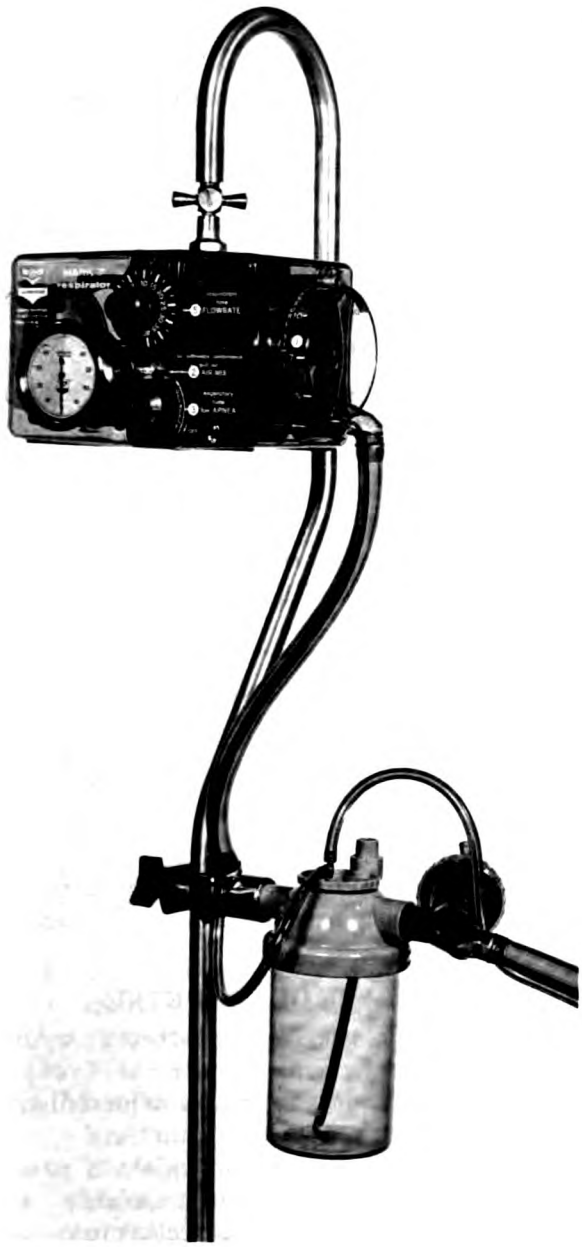


Figure 5–57. Other respirator models (Bird).

mucus, vomitus, blood, or other material obstructing the airway. Suctioning by catheter is necessary when a patient for any reason is unable to cough or otherwise clear the upper air passageway effectively and there is danger that he will aspirate the accumulated material into the lower passageway (trachea, bronchi, and lungs). Clean equipment is used since the throat, mouth, and nostrils are not sterile areas.

EQUIPMENT

Suction apparatus (mobile or portable aspirator, or in-wall suction unit)
Rubber tubing
Y-tube connector (glass or plastic)
Whistle-tip catheter (size 14 or 16 French for adults, size 10 or 12 for infants and children)
Glass of water
Mouth wedge
Receptacle for catheter: use either a forceps jar, 7½ inch; an IV bottle; a plastic bag; or a folded hand towel, pinned to form a bag
Electric extension cord p.r.n.
Gauze, 4-inch by 4-inch squares

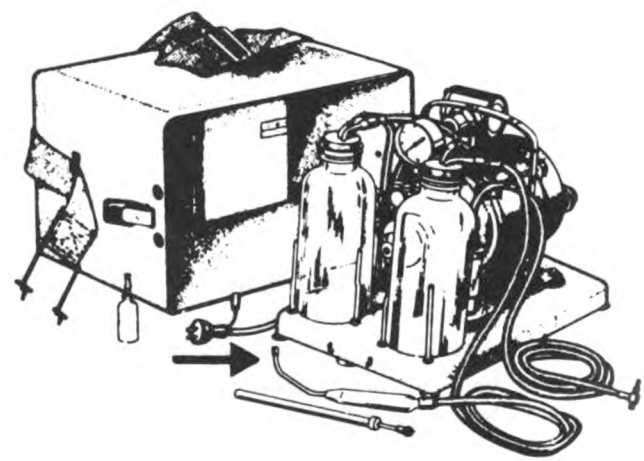
PREPARATION FOR SUCTION PROCEDURE

1. Set up equipment at the bedside. Place the portable electric-powered aspirator (fig. 5–58) on a bedside stand or table adjacent to the basic unit table. An extension cord may be needed to reach an electrical wall outlet.
2. Attach the catheter to the suction tubing with the Y-tube connector.

NOTE

The suction tubing is attached to the drainage bottle. The bottle marked "Vacuum" is connected to the motor.

a. *Whistle-tip catheter.* The large tip opening is more effective for suctioning thick secretions than sidewall perforations in a round-tip catheter. If a whistle-tip catheter is not available, one can be improvised by cutting a rubber round tip on a slant, smoothing the sharp edges by flaming with



NOTE: REMOVE METAL SUCTION TIP (INDICATED BY ARROW) AND SUBSTITUTE Y-CONNECTOR AND WHISTLE-TIP CATHETER.

Figure 5–58. Portable field suction machine.

a match and rubbing the softened edges between the fingers.

b. *Y-tube connector.* Applying or removing the thumb at the open end of the Y-tube provides safer suction control than pinching off and releasing a catheter attached to a straight connector.

3. Turn on the suction apparatus.
   a. *Wall suction.* Turn on regulating valve. Note position of float valve in the vacuum jar. It may be necessary to unscrew the jar from the metal cap and tap the float valve so that it moves freely on its metal stem—if it is stuck, the suction unit will not work. Use care to avoid crossing the threads in replacing the jar.
   b. *Portable aspirator.* Locate the switch (different models have different switch controls in different locations). Check the electrical outlet plug-in connection.
4. Test suction by inserting the free end of the catheter in the glass of water and closing the free end of the Y-tube with the thumb.
5. Place catheter, tested and ready for use, in the available receptacle. If a forceps jar (or IV bottle) is used, place this on the table next to the glass of water. If a plastic bag (or folded and pinned towel) is used, hang this at the side of the table. A catheter receptacle must always be used to prevent the catheter from dangling free or falling to the floor. If the catheter falls to the floor, replace it with a clean catheter stat.

SUCTION PROCEDURE

1. Turn on suction.
2. Test patency (nonobstruction) of catheter and functioning of suction by suctioning water through the catheter.
3. Apply suction to the patient's throat.
   a. *Through the mouth:*
      (1) With suction diverted from the catheter (free end of Y-tube open), insert the catheter gently toward the back of his throat. (To estimate distance to posterior pharynx, measure on the catheter the distance from the nose tip to earlobe and add 2 inches.)
      (2) Place thumb over Y-tube and rotate the catheter to suction secretions. CAUTION: Do NOT push the catheter in and out against the wall of the throat as this will injure the mucous membrane. Suction for 5 seconds or less. Prolonged aspiration may produce a drop in the arterial oxygen concentration.
      (3) Withdraw the catheter and clear it by suctioning water through it.
      (4) Use the padded mouth wedge when necessary to hold the patient's back teeth apart and control the tongue. (Request an assistant to hold the mouth wedge as necessary. If the patient's mouth cannot be opened or held open, insert the catheter through the nose.)
   b. *Through the nose:*
      (1) Moisten catheter in water.
      (2) With suction diverted, insert the catheter gently through a nostril to the back of the throat. This will stimulate the cough reflex and serve to make the suctioning procedure more effective.
      (3) Place thumb over Y-tube and rotate the catheter to suction secretions.
      (4) With suction diverted, withdraw catheter.
4. Clear catheter by suctioning water through it. Repeat mouth or nose insertion as necessary to clear throat.

CARE OF CATHETER

1. After each use, clear catheter with clean water.
2. Use moistened gauze pad to wipe adherent secretions from surface of catheter.
3. Use water for cleansing unless a prescribed, nonirritating, detergent-germicide solution (such as a 1:5000 benzethonium chloride (Phemoral) aqueous solution) has been ordered by the medical officer.
4. Place the cleansed catheter in the clean catheter receptacle after each use.
5. Exchange the catheter and the catheter receptacle at least once daily, replacing with clean equipment.

CARE OF DRAINAGE BOTTLE

1. Empty drainage bottle frequently. Always empty it when it becomes two-thirds full in order to prevent back flow into the vacuum bottle. (The ball float mechanism in the in-wall unit cuts off suction when the drainage level is at its maximum depth.)
2. Rinse the bottle in cold water. Wash thoroughly.

3. Leave clean cold water to a depth of 1 inch in bottle (or fill to line indicated).
4. Check drainage tubing and connections to insure airtight seal. Replace cracked or dried drainage tubing p.r.n.

5–70. Postural Drainage

In postural drainage the patient is placed in a semijackknife position to promote drainage of secretions from the bronchi and the lungs. The secretions move by gravity to the back of the throat, where they then can be expectorated.

PROCEDURE

1. The duration and the frequency of the treatment are prescribed by the medical officer. The treatment is usually started with 5 minutes of positioning, increasing the time to the prescribed length as the patient tolerates it. This may be 15 minutes, 4 times daily.
2. Plan to do postural drainage treatments before meals to decrease the possibility of regurgitation.
3. Unless otherwise ordered, use one of the following positions:
   a. *Gatch bed positioning.*
      (1) Elevate the knee gatch to the highest point.
      (2) Position the patient over the elevated mattress with his head to the foot of the bed (fig. 5–59 Ⓐ).
      (3) Place a board covered by newspaper on the bedsprings at the foot of the bed.
      (4) Place on the newspaper one or more plastic or paper sputum cups, a box of tissues, and a paper bag.
      (5) Instruct the patient to breathe deeply, to cough vigorously, and to cover his nose and mouth with several thicknesses of tissues while coughing, to help prevent spread of bacteria.
      (6) Have him turn from side to side while deep breathing and coughing to help loosen secretions.
      (7) Instruct him to use a second cup for expectoration when the one in use is half full. This is to avoid spilling.
      (8) Tell him to place used tissues in the bag but to leave the cups so that you can see their contents.
      (9) Watch patient for dizziness and fatigue.

Figure 5–59. Position of the patient, postural drainage.

      (10) After prescribed time, remove equipment and assist the patient to normal position. Tell him to lie flat for a few minutes.
      (11) Provide for patient handwashing and mouth care. If patient is ambulatory, assist him out of bed for self-care after he has lain flat for a few minutes.
      (12) Measure approximate amount of ex-

pectorated secretions by pouring water into a clean cup to the same level as contents of used cup, and then measure amount of water. Handle used cups with a clean paper towel, covering them and placing in the paper bag for disposal.

(13) Dispose of bag containing sputum cups and tissues according to local policy. Do not leave bag or cups in patient's room or at the bedside. They should be placed directly into a covered waste container for incineration.

(14) Record on Nursing Notes: time, duration, amount and character of secretions, and patient's tolerance.

b. *Cross-bed and footstool positioning.*

(1) Use this method only if gatch bed is not available. It is more hazardous and some patients cannot tolerate it.

(2) Place a footstool at the side of the bed, with a pillow for padding.

(3) Place sputum cups on newspapers on the floor.

(4) Assist the patient to jackknife himself across the bed, with his forearms resting on the footstool and his head near the floor (fig. 5–59 Ⓑ). Be sure he feels relatively secure and that he is strong enough to brace himself.

(5) Now follow steps 5 through 14 in (*a*) above.

5–71. Steam Vaporizer Inhalation

A steam vaporizer is used to provide moist heat to relieve congestion in upper respiratory passages. It may also be used to provide additional moisture in inhaled air for a patient with a tracheotomy. A commercial standard model steam vaporizer is illustrated in figure 5–60 Ⓐ , a room humidifier, cool-vapor inhalator in 5–60 Ⓑ .

GENERAL PRECAUTIONS— COMMERCIAL MODEL

1. Prevent burning of the patient. Keep vapor nozzle opening 12 to 18 inches away from him.
2. Check the water level at regular and frequent intervals to prevent boiling dry.
3. Close doors and windows in treatment area to confine steam vapor and increase humidity.
4. Prevent the patient from becoming chilled during and after treatment. Remove any damp bedding. Keep patient confined to warm, draft free area for at least 1 hour after treatment.

USE OF STANDARD STEAM MODEL

1. Obtain vaporizer from CMS.
2. Follow directions on unit for removing gallon jug. Fill bottle to level marked and invert into the reservoir.
3. Place medication, if ordered, in metal cup at base of unit, not in the jug. An aromatic compound such as tincture of benzoin is sometimes ordered.
4. Plug in cord and test switch before taking unit to bedside. Steam vapor should be visible within a few minutes.
5. At the bedside, place the vaporizer on the floor at the proper distance from the bed. Plug it in

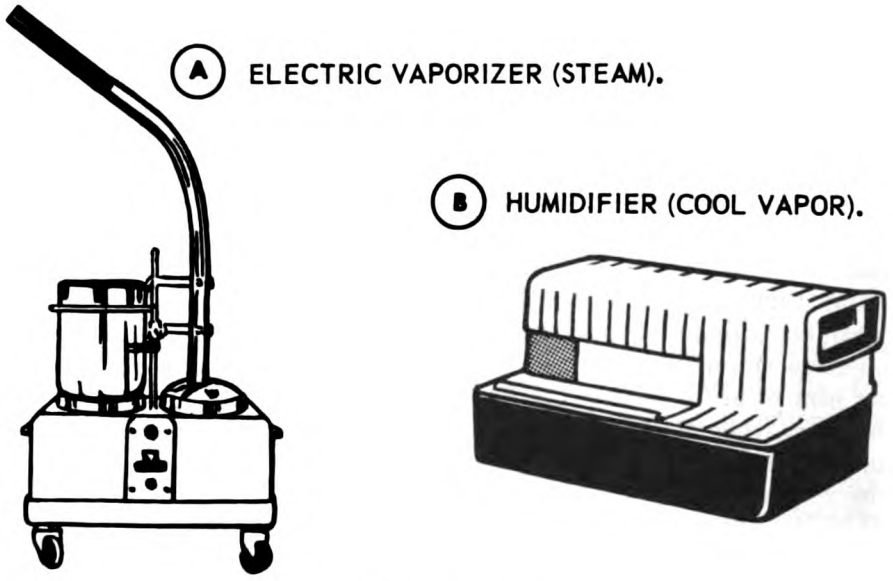


Figure 5–60. Steam vaporizers.

and turn on the swtich. Direct the flexible arm toward the patient's face.

6. Place a bath towel under his head to absorb condensation.
7. To increase effectiveness of vapor concentration, make a croup tent:
   a. Place two IV stands on either side of the bed, just forward of the patient's head and shoulders.
   b. Drape a cotton blanket over the stands, inclosing head-end of bed and partially inclosing patient. Secure blanket with safety pins.
   c. Direct the vaporizer spout into the tent upward and from the side.
8. Care for equipment.
   a. Turn off the switch and disconnect the plug.
   b. Empty the jug and the reservoir. Dry the metal parts.
   c. Use ether or alcohol to clean out any residue in the medication cup.
   d. Return unit to CMS.

STEAM INHALATION (IMPROVISED)

Equipment

Washbasin
Pitcher or No 10 tin can
Paper bag (size to fit over pitcher)
Hot plate
Bath towel
Medication, as ordered

Procedure

CAUTION

This method can be used only for a responsive patient who can sit upright on a chair. He should be reminded not to touch the hot container. In setting up and demonstrating this procedure, the medical specialist must make certain that the patient will not spill the boiling hot water on himself.

1. Cut hole in bottom of paper bag to fit over the mouth and nose of the patient.
2. Using the hot plate, heat water in pitcher or can to boiling. Add medication, if prescribed.
3. Place container of boiling hot water in the washbasin. Use folded bath towel to protect hand.
4. Place basin on table at the bedside. The basin must be on a flat secure surface, away from the edge of the table.
5. Fit paper bag over container.
6. Assist patient to seat himself at the table.
7. Have patient place his mouth and nose over hole in paper bag.
8. Drape bath towel over patient's head and container.
9. Instruct patient to open his mouth and take deep breaths to inhale steam, and to continue inhalation until steam vapor has subsided.

Section VII. THERAPEUTIC PROCEDURES—GASTROINTESTINAL TRACT

5-72. Cleansing Enema

The cleansing (evacuative) enema is the injection of fluid into the rectum to stimulate defecation. It is ordered if the number and character of stools indicate improper elimination, if the lower intestinal tract is abnormally distended by flatus (gas), or if the rectum or lower bowel must be empty of feces for an examination or an operation. Whatever the purpose, the enema must be given with proper technique to be effective and to lessen discomfort and the chance of possible injury to the patient. Basic points to be emphasized include—

a. Solution and Amount. The medical officer specifies the type of solution; he may or may not specify the amount. The usual amount required for an adult is 500 to 1000 ml. If the order is for "enemas until clear," the procedure is repeated until no fecal return is obtained. The specialist should always check with the nurse or doctor if after the second enema the returns are not clear; the patient may be exhausted by a third enema in succession. Solutions commonly used include—

(1) Plain tap water.

(2) Saline solution. This is a normal saline solution prepared for external use; it may be obtained from CMS or prepared on the ward. The proportion of sodium chloride to water when prepared on the ward is—

(*a*) When using sodium chloride tablets: 2 sodium chloride USP, 2.25 Gm. tablets to 500 ml. tap water.

(*b*) When using table salt: 1 level teaspoon salt to 1 pint (500 ml.) water.

(3) Soap solution. This must be a weak soap solution prepared with a bland, white toilet soap to avoid excessive irritation of the mucous membrane of the rectum and colon. The prepared solution should have only a slightly milky appearance, with no suds.

(4) Commercially prepared enema unit. The standard item available in AMEDD pharmacies contains sodium phosphate-sodium citrate in a 4½-ounce disposable injection unit. The advantages of this unit are its small volume, which lessens discomfort, and the ease of its administration. Instructions for use are imprinted on the container of solution.

b. Temperature. The recommended temperature of the enema solution is 105°, measured by a bath thermometer. If this standard item is not available, the temperature should be tested by pouring a small amount over the inner surface of the wrist; it should feel just warm, not hot.

c. Pressure and Rate of Flow. The enema is administered at a slow rate and at low pressure. Both rate and pressure are regulated by the elevation of the irrigator and the size of the rectal tube. The recommended elevation is no more than 18 inches above the level of the anus (fig. 5–61), measured from the surface level of the solution. The standard rectal tube is size 30 French; a smaller size tube may be indicated. Excessive pressure and rate of flow can damage tissue, cause discomfort, and defeat the purpose of the procedure since the patient will probably expel the solution before an adequate amount is given.

d. Position of the Patient. For best results, the patient should be lying down in a left, lateral (Sims) position. This favors relaxation of the abdomen and a desired flow of the solution into the left lower (Sigmoid) colon. After the enema is administered, the bed patient is turned on his back and placed on a bedpan; an ambulatory patient is assisted out of bed and escorted to the nearest toilet.

ROUTINE EQUIPMENT

Tray containing:
- Irrigator, 2 qt
- Tubing, clamp, and glass or plastic connector
- Rectal tube, 30 Fr
- Water-soluble lubricant (surgical lubricant)
- Toilet tissue
- Emesis basin
- Rubber treatment sheet

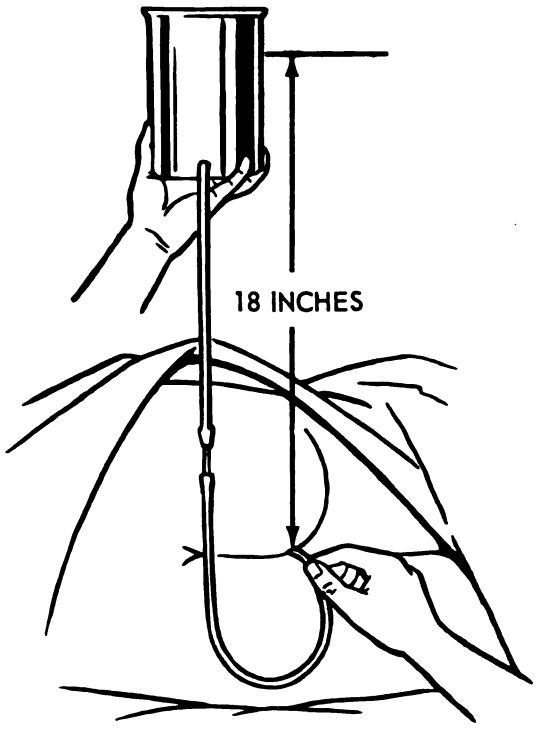


Figure 5–61. Administering the cleansing enema.

Drawsheet cover (or plastic-backed paper pad)
Bedpan with paper cover (for bed patients)
Solution, as ordered
Bath thermometer
Irrigating stand p.r.n.

ROUTINE PROCEDURE

NOTE

The procedure described here does not require the stand; if one is available, it is convenient for suspending the irrigating can, thus leaving one hand free.

1. Prepare the equipment in the utility room. (The irrigator and rectal tube are usually obtained from CMS.)
2. Connect the tubing to the irrigator. Clamp off the tubing.
3. Check temperature of prepared solution. If a separate pitcher or other container is used for solution preparation, pour required amount into the irrigating can.

NOTE

The capacity of the standard can is 2 quarts. Fill can approximately ½ for 1000 ml. of solution.

4. Place a liberal amount of lubricant on a piece of toilet tissue and wrap this around the tip of the rectal tube. Coil the clamped tubing on the tray.
5. Take the covered tray and bedpan (if a bed patient) to the patient's bedside.
6. Screen the patient and explain the procedure. (Assure the ambulatory paitent that he will be assisted to the toilet, and place his robe and slippers on the chair.) Lower the back rest, leaving one pillow under the patient's head. Remove or assist with the removal of pajama trousers. Place the protective sheet under the buttocks so that it protects the center and near side of the bed. Assist the patient to turn to left Sims position. Fold back the top covers to expose the buttocks only. Place the emesis basin on the protective sheet, convenient to use.
7. Expel air from the tubing: elevate the irrigator; holding the lubricated tip of the rectal tube over the emesis basin, release the clamp and allow a small amount of solution to run through; pinch the tubing and lower the irrigator.

NOTE

Hold the irrigator in the left hand, pinching off the tubing against the outlet with the thumb. Hold the rectal tube about 2 inches from the tip with the right hand.

8. With the back of the left hand, which is supporting the irrigator, raise the upper buttock to expose the anus. Tell the patient to breathe slowly through his mouth to relax the sphincter muscles.
9. Insert the rectal tube gently for about 4 inches. Hold the tube in place. Release the pinched tubing and elevate the irrigator approximately 18 inches above the anus. As the fluid enters the rectum, tell the patient to continue breathing slowly through his mouth.
10. If the patient complains of cramping, pinch off the tubing for a few seconds and lower the irrigator slightly. Continue at a lower pressure and slower rate.
11. Discontinue when just enough solution remains to cover the bottom of the irrigator. Pinch off and withdraw the rectal tube. Wrap the soiled end in a piece of tissue and place this end in the basin. Put the irrigator and the basin on the tray.
12. Turn the patient on his back and place him on the bedpan. Encourage him to retain the solution for several minutes. (Assist the ambulatory patient out of bed stat, and escort him, wearing robe and slippers, to the toilet. Instruct him not to flush the toilet until the enema return has been observed.) Elevate the back rest for a bed patient. Check the position of the bedpan; place the toilet paper and signal cord within reach before leaving the bedside.

CAUTION

Remain with weak and helpless patients.

13. Take tray to utility room. Rinse equipment in cold water. Use soap, water, and an applicator stick to clean the rectal tube opening.
14. Return to the patient with a basin of warm water. Remove and cover the bedpan. Assist the patient to cleanse himself with soap and water. Remove the treatment sheet, checking to make sure the bed is clean and dry. Replace the pajama trousers. Leave the patient clean, dry, and comfortable. Open a window, if possible, to air the area.
15. Check and note amount and character of the feces in the bedpan. If the contents are unusual, notify the nurse or doctor before discarding.
16. Clean and sanitize the bedpan. Wash, dry, and hang up the rubber treatment sheet to air. Place irrigator, tubing, and rectal tube at CMS collection point. Reset tray with clean equipment.
17. Record time, type of enema, color, consistency, and amount of feces in the Nursing Notes.

MODIFICATIONS

1. If the patient cannot be turned, use the dorsal recumbent position, elevating his hips by placing him on the bedpan before giving the enema. An assistant will be needed to separate and support the thighs of a helpless patient while the rectal tube is inserted and held in place.
2. If the patient can be turned but it is anticipated that he will be unable to retain the enema solution, use the left lateral position, providing in advance for some leakage by adequate protective coverage of the bed, plus a folded pad under the anus. Give the enema more slowly, with a smaller tube, with lower

pressure. An improvised device to prevent the solution from running out as fast as it runs in consists of a rubber ball (about the size of a tennis ball) with 2 holes through which the rectal tube is passed. As the enema is given, the ball is pressed against the anus.

3. If the patient is unable to expel the enema or if only a small amount is returned, prepare to siphon back the retained solution. You will need for the siphoning procedure: rectal tube, lubricant, funnel, pitcher of warm tap water, and about 18 inches of tubing with connector.
   a. Position the patient as for the cleansing enema. Place chair protected with paper adjacent to the bed with an uncovered bedpan on the chair seat.
   b. Assemble funnel, tubing, and lubricated rectal tube. Pinch off the tubing, pour water into the funnel and clear tubing of air, pinching off the tubing again as soon as some water runs through.
   c. Insert the rectal tube. Hold funnel at 18-inch elevation; allow about half the water in the funnel to run slowly in; then lower the funnel and invert over the bedpan to allow siphonage return. Pinch tubing at funnel outlet before turning it upright to pour in additional water.
   d. Repeat siphoning until enema and fecal return is satisfactory.
   e. Place the patient on a clean bedpan p.r.n. after removing the rectal tube.

5–73. Retention Enema

The retention enema is the injection of a small amount of a prescribed solution into the rectum for absorption or for temporary retention. The procedure is similar to the cleansing enema except that lower pressure and a slower rate of flow is used to avoid stimulating an immediate bowel movement. If the solution ordered is a medication to produce a general systemic or a local effect, only personnel authorized to administer medications may give the retention enema. However, an oil retention enema to soften fecal matter and to aid in its expulsion is not ordinarily considered as administration of medication. It is this procedure which is discussed below.

EQUIPMENT

Retention enema tray containing:
Funnel, glass or plastic (the barrel of a 1-oz bulb syringe may be used)
Catheter, number 20 French, round tip
Graduate or pitcher, 500 ml.
Cottonseed oil
Lubricant
Toilet tissue
Small rubber sheet and cover
ABD pad

PROCEDURE

1. Pour required amount of oil (90 to 120 ml.) into the pitcher. Place the pitcher in a basin of hot water to warm the oil to about 100°.
2. Attach the catheter to the funnel. Lubricate the tip of the catheter, using a piece of tissue.
3. Prepare the patient, explaining that it will be important for him to lie on his side quietly for at least an hour following the procedure. Position him as for the cleansing enema (para 5–72).
4. Test temperature of oil against the wrist.

CAUTION

Do not insert bath thermometer into the oil as it will be impossible to clean.

The temperature should just be tepid to warm; if satisfactory, place the pitcher on the tray and take the tray to the patient; if too warm, cool at room temperature before administering.

5. Proceed as for the cleansing enema. Pinch off the catheter, pour oil into the funnel, and momentarily release the catheter to expel the air. Pinch off the catheter again.
6. Insert the pinched-off catheter very slowly and gently about 4 inches into the anus, holding the funnel in the left hand. Elevate the funnel not more than 6 inches above the anus

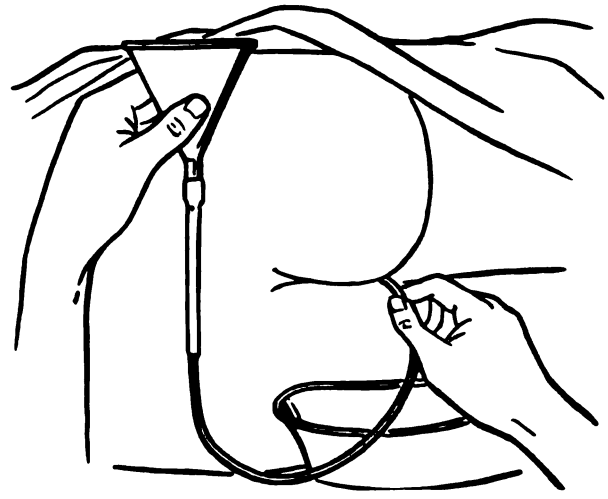


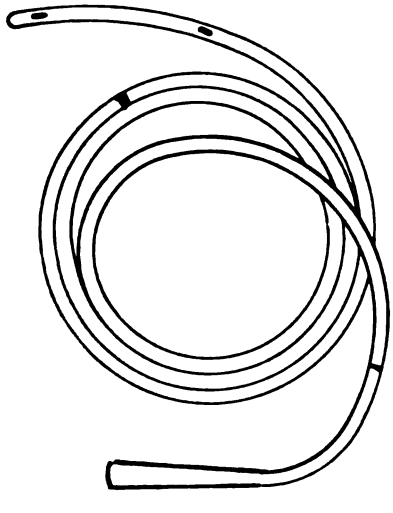
Figure 5–62. Administering the retention enema.

(fig. 5–62). Release the catheter. Give the oil very slowly.

7. Pinch off and withdraw the catheter.
8. If the patient has an urge to defecate, encourage him to breathe slowly through his mouth and apply gentle pressure against the anus with the ABD pad. Leave the pad against his buttocks.
9. Leave the patient in left lateral position and remind him to lie quietly for about 1 hour. Place signal cord within reach. Replace bed covering.
10. Wash equipment with hot soapy water, using friction to remove oil residue. Clean and reset tray.
11. Record time, type, and amount of oil given. Record 1 hour later if oil was retained, plus any subsequent bowel movement.

5–74. Fecal Impaction

Fecal impaction is the result of excessively hard, retained feces in the rectum. Fecal impaction may occur, especially when an immobilized, an elderly, an unconscious, or a paralyzed patient has improper fecal elimination. If cleansing enemas, properly administered, fail to give good results, an impaction can be suspected. An impaction is confirmed when the medical officer does a digital rectal examination using a lubricated glove. At the time of digital examination, the impacted feces are removed manually. This unpleasant procedure is usually followed by an order for an oil retention enema, cleansing enemas, and instructions for increased nursing vigilance. Good nursing care with attention to the patient's bowel pattern, diet, increased fluid intake, position changes, and encouragement of all possible activity are preventive measures for fecal impaction.



Levin tube

5–75. Gastrointestional Intubations and Related Procedures

Gastrointestinal intubation is the process of passing a tube through the nasopharynx or the oropharynx into the stomach or intestine. Intubation is done for one or more of the following purposes: To obtain specimens of stomach or duodenal intestinal contents for laboratory analysis; to lavage (wash out) the stomach; to gavage (tube feed) a patient; to provide for continuous drainage of fluids and gas to deflate the stomach and intestine by means of suction apparatus. This suction-drainage deflation procedure is referred to as gastrointestinal decompression.

a. Responsibility of the Medical Specialist. The intubation procedure is usually done by the medical officer. Under conditions specified by local hospital policy, the enlisted specialist may be authorized to intubate a patient. He is expected to know how to prepare the equipment, prepare the patient, assist the doctor as needed, and provide continued care of the intubated patient and equipment.

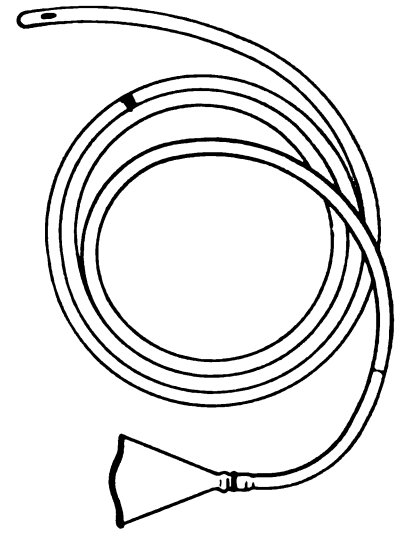
b. Types of Tubes. There are many different tubes with different names for different purposes. The tube required for a specific treatment is ordered by the doctor. Since gastrointestinal tubes are inserted into nonsterile body cavities, sterile technique is usually not required for insertion, although the tubes are sterilized before use. The medical specialist should be familiar with the general characteristics and uses of each; the different types are usually ordered by name, *for example:*

- *Levin tube.* This is a plastic or rubber soft-walled tube, available in sizes 12 French (small) to 18 French (large). It is inserted through the nose or mouth and has multiple uses—for collection of gastric specimens, lavage, gavage, or suction drainage. The Levin tube is usually specified in local policy directives as the type of tube that may be inserted by a nurse or by a qualified enlisted specialist.

- *Stomach tube (Ewald).* This is a rubber, heavy-walled tube, size 30 French, with a funnel attached. It is used for gastric lavage. It is stiff enough to be inserted through the mouth for emergency treatment by lavage of an unconscious or poorly cooperative adult patient. A distinctive band 20 inches from the tip is a marker to indicate the length the tube should be inserted.

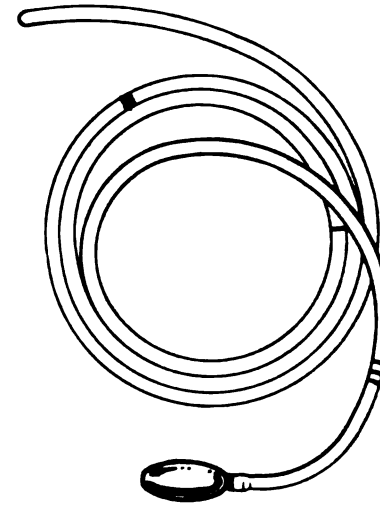
CAUTION

Severe damage can be done to the larynx, esophagus, or stomach during insertion; therefore, the procedure should be done only under direct medical supervision.



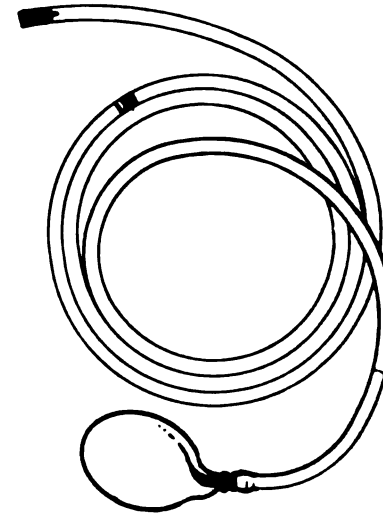
Stomach tube (Ewald)

- *Duodenal tube (Rehfuss).* This is a rubber tube, 40 inches in length, with a slotted metal tip. It is used primarily to obtain specimens of duodenal drainage for diagnostic purposes.



Duodenal tube (Rehfuss)

- *Cantor tube.* This is a 10-foot long, single-lumen (channel) tube used for intestinal decompression. The Cantor tube has a mercury-weighted rubber bag attached to its perforated tip to help carry the tube through the stomach and intestine. The mercury is placed in the bag with a syringe and needle before the tube is inserted nasally by the doctor.

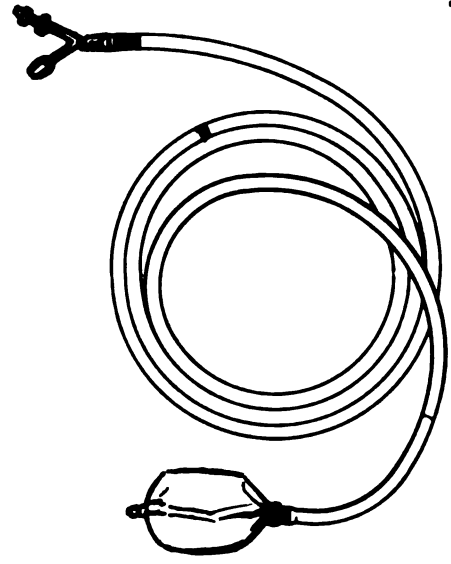


Cantor tube

- *Miller-Abbott tube.* This is a 10-foot long, double-lumen tube used for intestinal decompression. The Miller-Abbott tube has a balloon attached at the perforated tip and a metal Y-assembly at the other end. One branch of the Y-assembly connects to the lumen leading to the balloon; it is used only for inflation. The other branch of the Y-assembly connects to the lumen leading to the perforations; it is used for aspiration and irrigation. The doctor inflates the balloon after the tube has passed through the pylorus.

NOTE

The Miller-Abbott and the Cantor tube are radiopaque and their location in the stomach or intestine show clearly on radiography (X-ray) or fluoroscopy; this type of examination is often ordered during the course of treatment.



Miller-Abbott tube

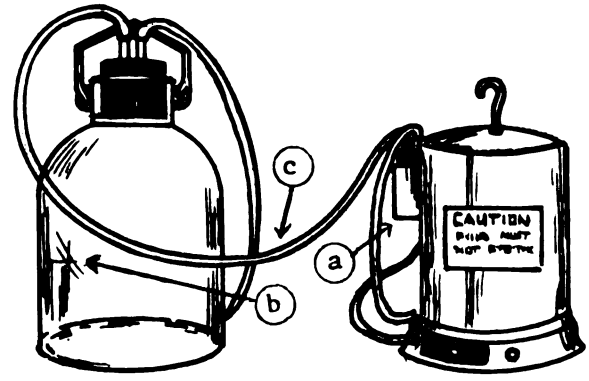
5–76. Suction—Drainage Mechanical Apparatus

Suction—drainage mechanical apparatus used with gastrointestinal tubes is designed to provide controlled, relatively low-pressure suction to avoid injury to mucous membranes. Two types commonly used are an electric-powered pump (Gomco or Emerson) and a hand-pump tank (Phelan). In hospital areas such as a recovery ward or intensive care, a special suction unit may also be available for use with a wall suction outlet.

NOTE

The term "Wangensteen suction," is often used in referring to any type of gastrointestinal suction apparatus, in recognition of the original and traditional 3-bottle, water pressure suction unit, devised by Dr. Wangensteen.

a. Electric Drainage Pump (Gomco). This apparatus (fig. 5–63) is an electric-powered, motorless pump. A partial vacuum in the drainage bottle is created by a heat-exchange mechanism. The mobile unit and the portable unit are used interchangeably. If the portable unit is used, always place the pump assembly above the drainage bottle—*for example,* hang the pump unit on the bedframe. Place the gallon bottle on a footstool or in a bottle holder.



Ⓐ Trap bottle. Ⓑ Drainage from patient.
Ⓒ Suction bridge from trap to drainage bottle.

Figure 5–63. Electric drainage pump (Gomco).

NOTE

To prevent fluid from being drawn into the suction bridge, empty the drainage bottle when two-thirds full. Any fluid inadvertently aspirated into the suction bridge will be caught in the trap bottle.

To operate the Gomco apparatus:

(1) Set the switch control to the high or low vacuum (suction) pressure ordered by the doctor.

CAUTION

Never change this control except on order.

(2) Plug in the cord to the wall outlet.
(3) Turn switch on.
(4) Test for suction by inserting the tip of the drainage tube in water. (There will be a slight delay in suction when the unit is first connected.)

b. Emerson Postoperative Pump. This apparatus (fig. 5–64) is a high volume, low-pressure pump, operated by an electrical motor. It can be

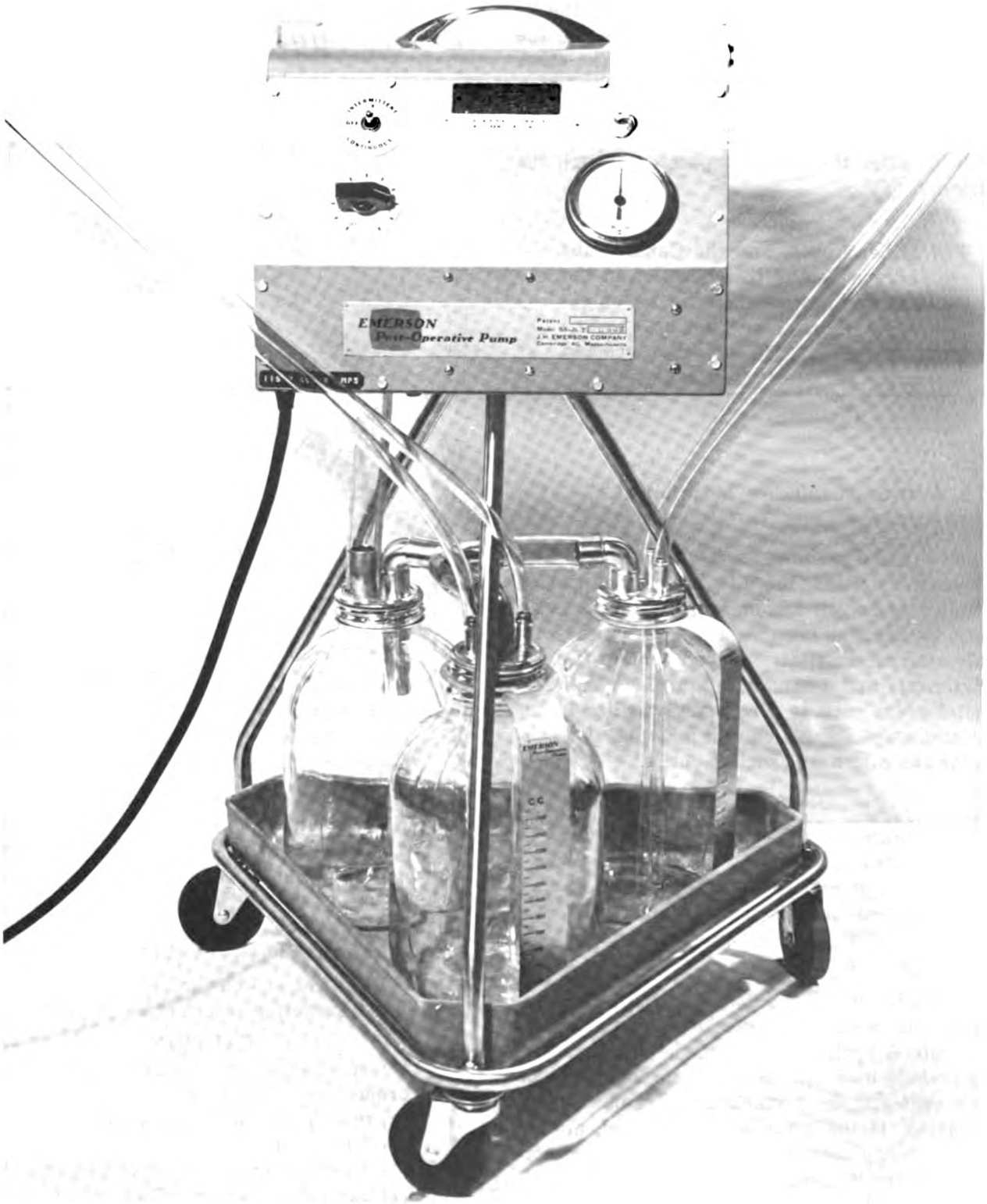


Figure 5–64. Electric drainage pump (Emerson, 2-patient).

used to maintain negative pressure in the pleural space or for continuous or intermittent suction elsewhere. The manufacturer's instruction manual and the local procedure manual should be referred to for operating instructions.

NOTE

The pump is designed for use at the bedside in wards, intensive care units, and recovery rooms. It must not be used in the operating room or other hazardous atmospheres.

c. Hand-Pump Apparatus (Phelan Pump). This is a portable metal tank with a hand pump (fig. 5–65). The partial vacuum in the drainage bottle is created by pumping air out of the tank. If all connections are maintained properly, the vacuum pressure lasts approximately 20 hours and can be renewed by again using the hand pump. The Phelan pump is equipped with a drainage bottle; a 2-hole rubber stopper fitted with two short pieces of metal tubing; and two pieces of rubber tubing, each about 4 feet long. This apparatus has superseded other nonelectric, field-type pumps.

(1) *To connect the apparatus:* Fit the 2-hole stopper tightly into the drainage bottle. Connect one end of each of the two pieces of tubing to the metal tubing in the stopper. Connect one piece of tubing to the tubing adapter on the tank. Then connect the second piece of tubing to a glass or plastic connecting tip. This is the drainage tube connection leading to the patient's tube.

(2) *To prepare pump:* Close needle valve by turning knob clockwise. Clamp off the drainage tube leading to the patient. Pump handle 40 to 50 strokes or until the gage registers 3 to 5. (The gage is calibrated in inches of mercury.)

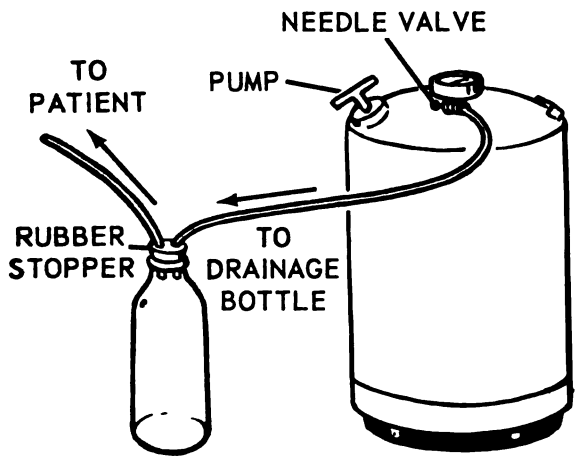


Figure 5–65. Hand-pump apparatus (Phelan).

(3) *To test for suction:* Open needle valve by turning knob counterclockwise. Release clamp on drainage tube. Test for suction by inserting the connection end of the drainage tube in water.

(4) *For operation:* Attach drainage tube connector to patient's tube. Watch the tank gage during operation. Keep it between 3 and 5.

5–77. Levin Tube Intubation

Gastric intubation using a Levin tube is done to obtain a specimen of stomach contents, to lavage the stomach, to gavage a patient, or to allow for drainage of stomach contents by suction apparatus. Local hospital policy determines the circumstances when intubation is done by the medical specialist.

EQUIPMENT

Assemble the following clean items on a tray:

Levin tube, size 16 French or specified size
Sponge basin containing ice* p.r.n.
Asepto syringe, 30 ml.
Emesis basin
Paper tissues
Surgical lubricant
Glass of water
Drinking tube
Bath towel, safety pin
Rubber or plastic protective sheet

Use ice to chill a rubber tube to stiffen it and make insertion easier. Do not chill a plastic tube.

PROCEDURE

1. Tell the patient what is to be done. Screen the unit. Position him sitting upright in bed, supported on the back rest, or out of bed on a chair.
2. Place the equipment tray on the bedside stand.
3. Pin the towel around his neck. Place the protective sheet over his lap and bedding.
4. Place the tissues and the glass of water convenient to the patient's hand. Tell him that small sips of water will help him to swallow during the procedure and that he can expect tears and flow of nasal secretions.

CAUTION

Do not emphasize the possibility of gagging or vomiting, but place the emesis basin convenient to your hand.

5. Pick up the tube, rotate it to the position of greatest droop, and lubricate the tip. Use a light coating of surgical lubricant for nasal

insertion; dip the tube in water to lubricate it for oral insertion. Hold the lubricated tube about 6 inches from the tip in the right hand. Hold the remainder of the tube in the left hand, supporting the tube to prevent any downward drag. (Reverse holds if left-handed.)

6. Insert the tube:
   a. For oral insertion:
      (1) Tell the patient to tilt his head backward slightly and to open his mouth wide.
      (2) Pass the tube over the center of the tongue, directing it toward the back of the throat.
      (3) Tell the patient to close his lips lightly on the tube, to tilt his head forward slightly to a natural position for swallowing, and then to swallow. As he swallows, push the tube down a few inches.

   b. For nasal insertion:
      (1) Tell the patient to tilt his head backward slightly and to breathe through his mouth.
      (2) Insert the tip of the tube into the selected nostril, passing it along the floor of the nose to the pharynx.
      (3) Tell the patient to tilt his head forward to the natural position for swallowing, and then to swallow. As he swallows, push the tube in a few inches.
7. With each swallow, insert the tube a few inches, using firm steady pressure. Do not hurry and do not attempt to insert the tube faster than the patient can swallow. If it is allowed, tell him to take sips of water to encourage him to swallow naturally. Insert the tube to the predetermined distance, as indicated by circular marking on the tube.

CAUTION

Discontinue insertion immediately if the patient coughs or chokes. Remove the tube completely. Allow him to rest for a few minutes before attempting reinsertion. Discontinue the procedure if he again coughs, chokes, or gags excessively. Do not exhaust the patient or use force. Report two unsuccessful attempts and request competent assistance and supervision before continuing.

8. Test for placement of tube in stomach by aspirating with the asepto syringe. Squeeze the bulb before fitting the syringe tip snugly into the distal end of the tube to avoid injection of air when aspirating. Release the bulb and observe the barrel of the syringe for gastric content return. If repeated aspiration is needed, pinch off the tube, withdraw the syringe tip, squeeze the bulb, and reinsert the syringe into the tube. Do not inject air or water until aspiration is successful. Test to make sure the tube is not in the trachea. As the patient exhales, immerse the end of the tube momentarily in water. No bubbles should appear. If they do appear on exhalation, pinch off and remove the tube immediately. If it is certain that the tube is in the stomach but no secretions have been aspirated, wait a minute or so. Encourage the patient to relax. Try aspiration again. The tube sometimes becomes kinked or momentarily plugged with mucus or a food particle.
9. Following successful aspiration, carry out the procedure for which the tube was inserted:
   - Securing a specimen—table 5-8.
   - Lavage—para 5-81
   - Gavage—para 5-80
   - Suction drainage—para 5-78
10. Report and record procedure on Doctor's Orders (DD Form 728) and Nursing Notes (DD Form 640).
11. To remove the Levin tube—
    a. Following oral insertion: Hold some tissues at the chin. Pinch the tube to prevent any fluid contents from spilling into the trachea as the tube is withdrawn. Remove the tube smoothly and quickly, catching it in the tissues. Place tube and tissues in an emesis basin.
    b. Following nasal insertion: Hold some tissues at the nostril. Pinch the tube and withdraw as in oral insertion above.
12. Immediately after removal of the tube, assist the patient to rinse his mouth and wash his face.
13. Change any soiled bedding. Adjust the patient's position to one of comfort. Remove the screens. Leave the patient and the unit tidy. Take all equipment to the utility room.

Care of Equipment

1. Discard waste and disposable equipment.
2. Rinse reusable equipment to be returned to

CMS. To rinse the tube, use a syringe and flush cold water forcibly through its length.

3. Rinse, wash, sanitize, and dry equipment that is retained on the ward.
4. Return clean equipment to its proper place.

5–78. Gastrointestinal Suction Drainage (Levin Tube)

Suction drainage by means of a mechanical drainage apparatus is ordered when drainage is to be continued for an extended period.

EQUIPMENT

Levin tube intubation equipment
Suction apparatus
Adhesive tape
Elastic bands
Safety pins
2 clamps (Hoffman or rubber-shod hemostats)
Intake and Output Worksheet (DD Form 792)
Paper tissues
Antiseptic mouthwash
Toothbrush and dentifrice
Cotton-tipped applicators
Tube of petrolatum or cold cream
Emesis basin

PROCEDURE

Connecting the equipment:

1. Assist with intubation procedure p.r.n.
2. Test suction apparatus before taking it to the bedside. Clamp drainage tubing.
3. Connect drainage tubing to Levin tube.
4. Open clamp. Observe for drainage in glass or clear plastic connector attached to Levin tube.
5. Tape tube in place at nostril, using 2 strips of adhesive. Split one 3-inch length of adhesive halfway down its length. Wrap one split end around the tube at the nostril entry point. Center the tube in the nostril to prevent pressure on either side. With the two free ends, anchor the tube below the nose (moustache fashion) or to the cheek and side of the nose. Use a second 3-inch piece of tape to anchor the tube toward the side of the face in order to help support the weight.
6. Support the drainage tubing by anchoring it to the bottom bedsheet with a safety pin. Use an elastic band looped around the tubing near the connector and pin the elastic to the sheet, or catch a portion of the sheet on either side of the tubing with the pin to form a trough. With either method, allow sufficient length of tubing to prevent pull on the tube when the patient moves.

Checking Equipment During Treatment

1. Check operation of suction equipment frequently for all of the following:
   a. Kinked or constricted drainage tube.
   b. Airtight connections.
   c. Suction device—if Gomco, check the wall plug, the switch, the pressure setting; if Phelan, check the gage and needle valve.
2. Look at the drainage flowing through the connector tube, as well as the accumulated drainage in the bottle. If no drainage is observed and all other checks have been made, the tube may be clogged. Failure to drain may be due to the end of the tube adhering to the wall of the stomach. If this is the case, try these two nursing measures:
   a. Change the patient's position by turning him to his opposite side or by raising or lowering the head gatch.
   b. Adjust the Levin tube by loosening the tape anchor, pulling the tube out an inch or two, then retaping. Report failure of suction drainage if after following steps a and b above, no drainage is observed. In this case, irrigation to clear the tube may be ordered by the doctor.

Care and Handling of Drainage During Treatment

1. Observe frequently the color and amount of drainage. Report any changes immediately to the nurse or doctor. Cloudy, pale-yellowish drainage is characteristic when the tube is in the stomach; bile-colored (greenish) drainage is characteristic when the tube is in the duodenum. In gastrointestinal drainage, blood varies in color—it may be dark red when fresh, dark brownish-red or in brown particles ("coffee ground drainage") if it has been partially digested. Fecal odor of the drainage is noticeable in intestinal obstruction.
2. Measure the contents and empty the drainage bottle (a) at the hour designated, (b) when the drainage bottle is two-thirds full, or (c) when suction is discontinued.
3. To empty the drainage bottle—
   a. Clamp the Levin tube. Remove stopper of drainage bottle. Place stopper in emesis basin. Take bottle to utility room.
   b. Measure and record amount of drainage.

Dispose of measured drainage by flushing into hopper or toilet commode.

c. Rinse the bottle with cold water. Then wash thoroughly with prescribed detergent solution. Rinse and drain.

d. Reconnect clean bottle, replacing the stopper securely. Release clamp. Observe for effective renewal of suction drainage.

Observation and Care of the Patient

1. Provide good oral hygiene at regular and frequent intervals. Offer water or mouthwash to rinse the mouth every hour. Assist the patient to brush his teeth at least every 4 hours.
2. Cleanse nostril margins with a moistened cotton-tipped applicator at least once every 4 hours.
3. Using applicator, apply lubricant to the cleansed lips and nostrils at least every 4 hours.
4. Encourage the patient to swallow saliva naturally; the tube is a constant source of annoyance, and the patient may have a tendency to expectorate excessively. The medical officer may allow chewing gum to help maintain mouth moisture and to encourage normal swallowing of saliva. Chewing gum is provided only for conscious, responsive, alert patients.

CAUTION

Remind the patient to remove gum before mouth care and sleep.

5. Report complaints and signs of nose or throat irritation (excessive mucus, sore throat, or hoarseness).
6. Encourage patient to change position frequently, using care not to pull on the tube and not to lie on the drainage tubing.
7. Follow diet orders exactly. If water or clear fluids are allowed by mouth, be sure to check on amount to be given at one time. Know exactly whether or not the tube is to be clamped when fluids are given and at what time interval in relation to oral intake. For example, the order may be to clamp the drainage tube for 1 hour after intake to allow some absorption.
8. Keep accurate intake and output records. Large amounts of fluid and electrolytes are lost during continuous suction drainage, and information on all intake and all output is used by the doctor in planning fluid replacement.
9. Observe the patient frequently when he is asleep, noting the tube marking at the nostril. The patient may have unknowingly pulled the tube out partially or completely. If partially out, advance the tube to the required point, and check for drainage. Tape securely after noting drainage. If the tube has been accidentally removed, notify the nurse or doctor. Reinsert only on order.

Levin Tube Irrigation

1. Irrigate only on order by the medical officer. (The type and amount of solution and frequency of irrigation must be specified.)
2. Measure amount of irrigating solution accurately and record on the I & O worksheet as specified by local directive.
3. Do not use the syringe to aspirate back the irrigating solution unless ordered to do so; ordinarily, all solution used to irrigate and clear the tube will be returned in the suction drainage.
4. Do not use a Luer-type syringe unless so ordered. An asepto (bulb) syringe is recommended for use with a Levin tube because less pressure is exerted.

Equipment

Sponge bowl
Asepto syringe (30 ml.)
Emesis basin
Solution ordered (at room temperature, unless otherwise specified)
Rubber-shod hemostat forceps, 2

Procedure

1. Pour solution into sponge bowl.
2. Clamp drainage tubing.
3. Place emesis basin under connecting tip between Levin tube and drainage tubing.
4. Clamp Levin tube (or pinch off with fingers) and disconnect Levin tube from connector.
5. Fill syringe, insert syringe tip into Levin tube, and release tube. Gently squeeze bulb to inject 30 ml. of solution. If fluid flows in freely, the tube is open.

CAUTION

Do not use force.

6. Clamp Levin tube and remove syringe.
7. Reconnect Levin tube to the drainage tubing.
8. Release clamps. Observe glass connector to see if solution drains properly on reestablishment of suction.

9. Record time, amount, and type of solution used on I & O worksheet in intake column.

Care of Irrigation Equipment

1. Following a one-time irrigation, remove equipment. Rinse it and return it to CMS.
2. If equipment is kept at the bedside for repeated irrigation at scheduled intervals, rinse syringe in tap water and keep syringe and solution bowl between folds of the wrapper. Replace with clean equipment daily.

NOTE

Use sterile equipment for each irrigation as ordered following gastrointestinal surgery.

To Administer Medication Through the Tube

1. Pour required medication into a medicine glass or paper cup, following the rules in paragraph 4–25 and table 4–5.
2. Add 15 to 20 ml. of water. Stir thoroughly, using a clean tongue blade. Place medication, paper cup of water, tongue blade, and medicine card on the medicine tray.
3. Clamp the drainage tube leading to the suction. Clamp the Levin tube and disconnect it from the glass or plastic connector.
4. Insert syringe tip into Levin tube and pour medication into the syringe. Release the clamp.
5. Follow the medication with 30 ml. of water to clear the tube.
6. Reconnect the Levin tube and the drainage tube. Unless otherwise ordered, leave the Levin tube clamped for 1 hour to provide for absorption.
7. Record time, medication, and amount of water administered. Also, record the time the tube was clamped and the tube was opened.

Discontinuing Suction

1. Clamp off the Levin tube.
2. Turn off the suction apparatus.
3. Disconnect Levin tube from the glass connector.

CAUTION

Do not remove Levin tube unless so ordered. The tube may be left in place for several hours to see if the patient tolerates discontinuance of suction drainage. (To remove the tube, refer to paragraph 5–77).

4. Protect open end of Levin tube by folding the end over and wrapping in a 4- by 4-inch gauze square secured with a rubber band.
5. Take drainage tubing and suction apparatus to the utility room.
6. Measure drainage. Record.
7. Rinse reusable equipment with cold water. Flush cold water forcibly through all tubing, using a syringe.
8. Follow prescribed procedure for returning equipment to CMS or for cleaning and storing it on the ward.

5–79. Intestinal Decompression

Intestinal decompression accomplished by intubation with a Miller-Abbott or a Cantor tube and the application of suction are similar in many respects to gastrointestinal decompression with a Levin tube. Important differences include the following considerations:

a. Intubation is done by the medical officer.

b. The Miller-Abbott (or Cantor) tube is not taped to the patient's face following intubation. Since the tube is designed to advance through the stomach into the small intestine by gravity and peristalsis, taping or otherwise securing the outside length could interfere with the desired advancement. The long distal length of tube is coiled loosely at the head of the bed unless otherwise ordered.

c. Position and activity of the patient following intubation contribute to the advancement rate of the tube. The specialist must know the position, the sequence, and the time interval ordered for each change in position, and modify other patient care measures accordingly. *For example,* after the tube has been introduced into the stomach, placing the patient on his right side with the foot of the bed elevated for a specified time interval facilitates the passage of the tip of the tube into the pylorus. Once the tube starts to advance, subsequent positions may be ordered: on the back, in Fowler's position; followed by on the left side, with the bed flat; followed by ambulation.

NOTE

Explaining to the patient and securing his full cooperation is very important, but the patient may be too ill to understand instructions or to realize that the tube is anything more than a constant source of annoyance and discomfort.

Special vigilance is required, and full supportive nursing care must be provided to help the patient tolerate the tube.

EQUIPMENT

INTESTINAL TUBE (MILLER-ABBOTT)

Y-tube assembly, consisting of—
- Y-connector (glass or clear plastic)
- 4-inch lengths of latex drainage tubing, 3
- Clamps (Hoffman or rubber-shod hemostats), 2
- Sponge bowl with ice
- Syringe, 30 ml. Luer
- Basin, emesis
- Lubricant, as ordered
- Protective rubber or plastic sheet
- Bath towel
- Safety pins
- Facial tissues
- Glass of water with drinking tube
- Suction apparatus (Gomco, Phelan, or Emerson)
- Local anesthetic, as ordered (topical anesthetic agent)
- Applicator swabs and atomizer spray p.r.n.
- Thumb forceps (straight or bayonet type)

PROCEDURE FOR EQUIPMENT PREPARATION

1. Assemble equipment.
2. Prepare the Y-tube assembly as illustrated in figure 5–66. Do not connect to Miller-Abbott tube before intubation.
3. Set up suction apparatus. Test to make sure it is in working order.
4. Check doctor's order for local anesthetic. Place labeled container of anesthetic on tray. Provide atomizer spray and cotton-tipped applicators for the medical officer's use p.r.n.

INTUBATION PROCEDURE

1. Position the patient as directed by the medical officer—high Fowler's position or supine. Place protective covering as for Levin intubation.
2. Assist doctor, as he directs, with local anesthetic nasal instillation.
3. Assist with intubation p.r.n. The doctor will intubate the patient. The deflated balloon is

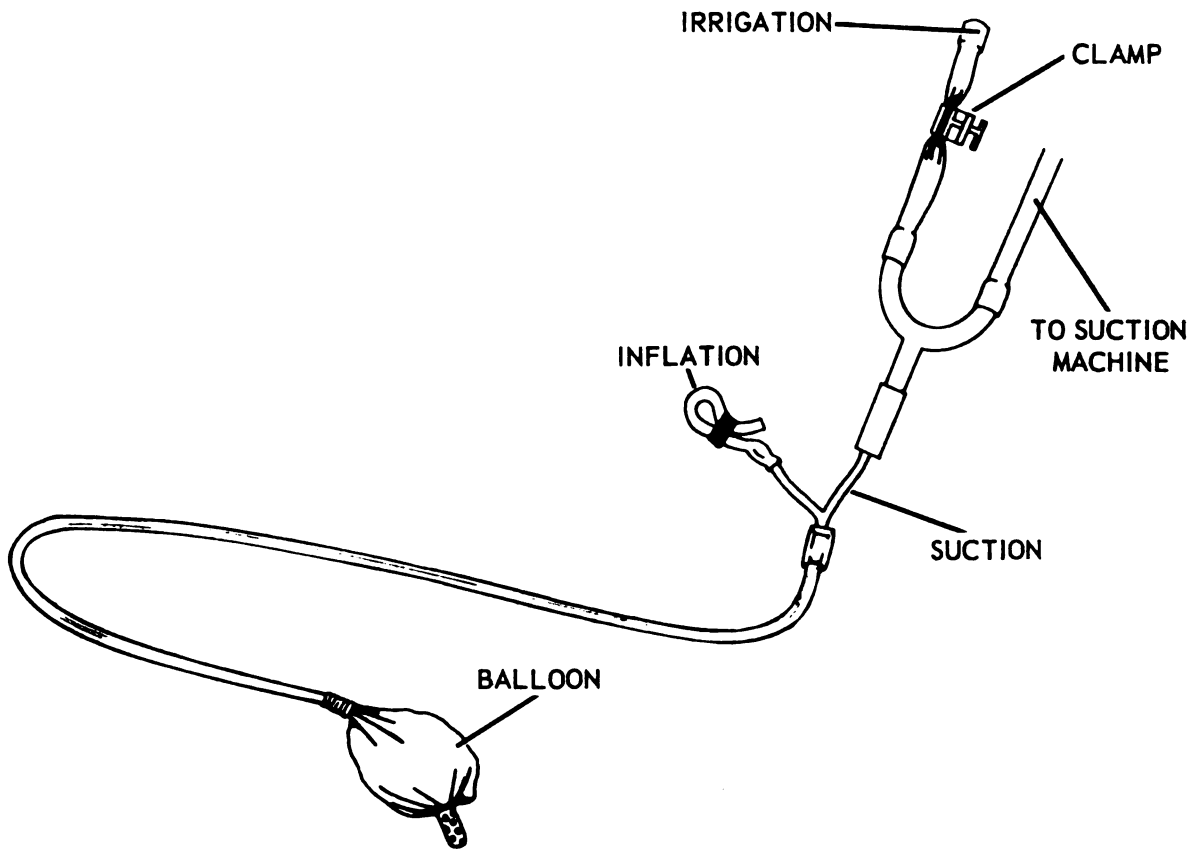


Figure 5–66. Miller-Abbott tube irrigation and suction assembly.

folded umbrella-like and passed through the nose. The doctor will aspirate with the Luer syringe initially to insure tube location in the stomach.

4. Follow exact orders for positioning of patient after intubation.
5. The doctor may test for advancement of the balloon into the intestine by attaching an empty Luer syringe with a loose-fitting plunger to the inflation lumen of the tube—if the balloon is in the intestine and peristalsis is present, the movement of the intestine on the balloon will make the plunger move in the barrel. Keep this "Testing Syringe" at the bedside for the doctor's use.

NOTE

Intubation and decompression procedure with a Cantor tube is similar in most respects to the procedure for the Miller-Abbott tube. Mercury is injected into the bag of the Cantor tube before intubation; then with the bayonet thumb forceps, the doctor elongates the mercury-weighted bag while it is inserted nasally. A Y-tube assembly may also be used for suction and irrigation.

Continuation of Patient Care

1. Connect suction apparatus when ordered. This may be immediately after the doctor has aspirated stomach contents, or only after tube has advanced. Using Y-tube assembly, attach suction arm to the suction apparatus. Clamp off irrigation arm. Open suction arm.
2. Coil extra length of Miller-Abbott tube at head level on the bed.

CAUTION

Do not tape Miller-Abbott tube in place or fasten it to the bedding. When suction is connected, support drainage tubing by securing it to the bed below the connector tip of the Y-tube.

3. Position the patient as ordered. Follow orders for position, sequence, and time interval. Note these orders on Nursing Care Plan (DA Form 8–250) at the bedside.
4. Follow observation and care of the patient procedures in paragraph 5–78.
5 Be particularly observant for any signs of peristalsis; *for example,* passage of flatus by rectum. This is a favorable sign that intestinal function is returning. Record and report this to the nurse or doctor.
6. Follow orders for manual advancement of the tube. Once it has reached the duodenum, if peristalsis is active, the tube may advance automatically about 12 inches each hour without any manual assistance. Note at regular intervals the advancement observed or its failure to advance. A responsive patient may be instructed by the doctor to advance the tube manually.
7. Unless otherwise ordered, transport the patient on a stretcher to X-ray or fluoroscopy, maintaining the required position. Discontinue suction temporarily by clamping the tube, disconnecting the Y-tube assembly, and protecting the open end of the Miller-Abbott tube with a clean, dry 4- by 4-inch gauze square fastened with a rubber band. Clamp the suction drainage tubing and turn off the suction while it is disconnected.

Removal of the Miller-Abbott Tube

1. Follow the directions of the doctor for—
   a. Disconnecting suction.
   b. Deflating tube.
   c. Withdrawing tube. The tube is usually withdrawn gradually, a few inches at a time; for example, 3 inches every 5 to 10 minutes. The patient may feel nauseated because the tube is pulling against peristalsis.
2. Provide immediate mouth care when the tube is finally withdrawn. The taste and odor of the tube are foul.

NOTE

If the tube has passed far down in the intestinal tract, the doctor may decide to cut the tube at the nostril and allow peristalsis to carry its full length through for rectal removal. (Reassure the patient that this indicates excellent intestinal function.)

5–80. Gavage

Gavage or tube feeding is used to provide nourishment to a patient who is unconscious or unable to swallow, or who refuses food. A liquid formula prepared by food service is ordered by the doctor. Water and medications in solution are also given by gavage. A nasogastric (Levin) tube or a plastic small caliber (size 12) nasal feeding tube is usually used. Following insertion the tube is taped in place for subsequent feedings.

NOTE

Formula prepared by food service is always labeled with the patient's name and dated. The container must be stored in the refrigerator. Food service personnel check for and remove outdated supplies from the ward refrigerator, but ward personnel must be aware of the necessity of using only fresh, refrigerated, properly identified gavage feedings. Local policy may require frequent changing of nasogastric tubes when patient is receiv-

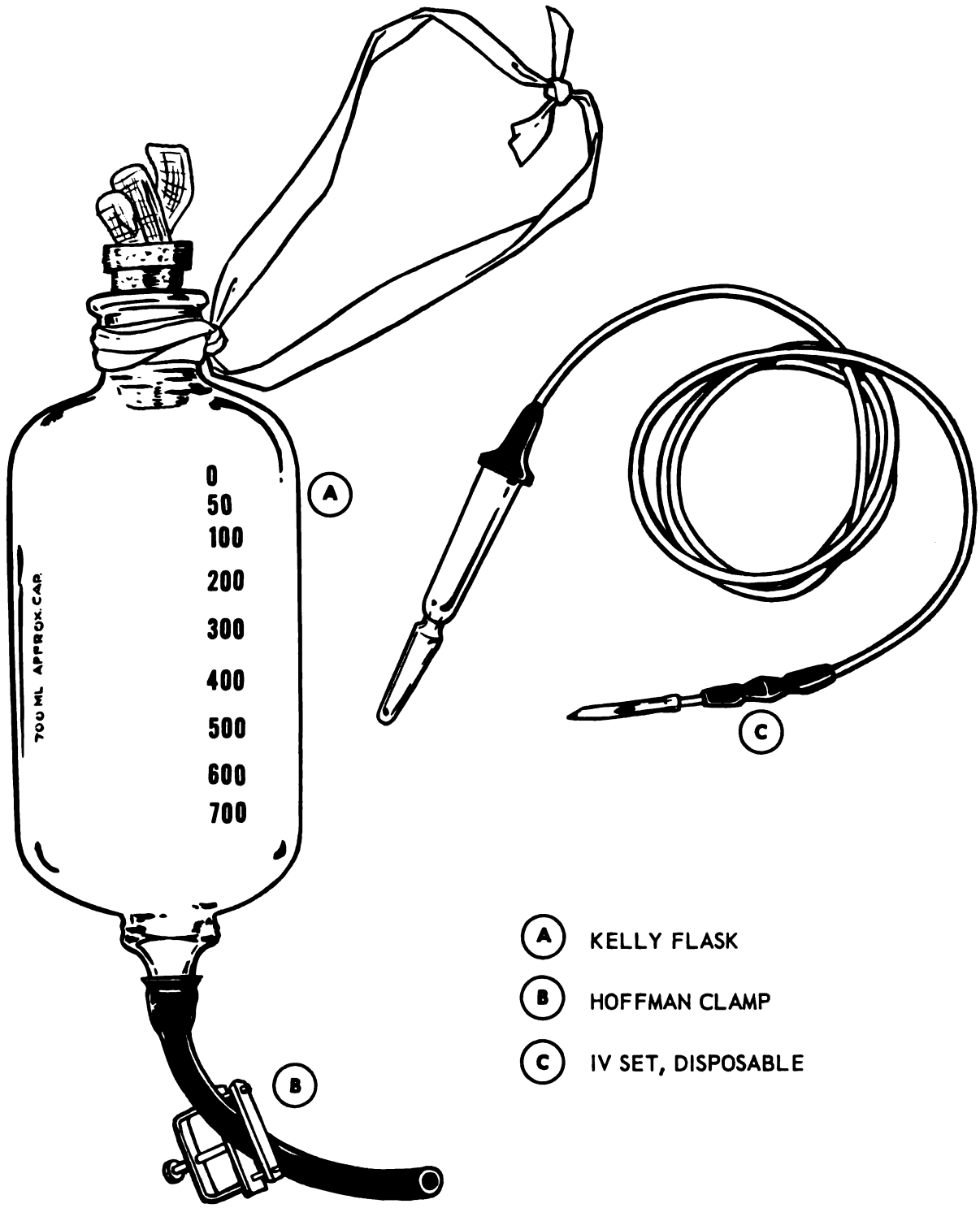


Figure 5-67. Gastric feeding set.

ing gavage feeding for a prolonged period of time.

a. Funnel Method. For the funnel method, the cylinder of a 30 ml. asepto syringe is inserted in the end of the tube, and the feeding is poured in slowly. (For a one-time feeding, a standard feeding tube with attached funnel is occasionally used. This tube is inserted orally.)

b. Drip Method. For the drip method, a feeding set (fig. 5–67) assembled in CMS is used. A glass flask (Kelly bottle) connected to disposable IV tubing is suspended from an irrigating stand. The gavage feeding drips into the tube at a preset drop rate.

EQUIPMENT

(Following intubation, nasogastric tube)

Food service tray with paper cover
Asepto syringe, 30 ml.
Liquid feeding, as ordered
Pitcher (500 ml.) for formula
Glass of water
Hand towel
Clean 2- by 2-inch gauze square
Elastic band
Hoffman clamp (or other small tubing-clamp)

PROCEDURE (FUNNEL METHOD)

1. Assemble equipment in clean work area. NEVER prepare gavage equipment in the utility room. Pour required amount of properly identified formula into the pitcher. Set the pitcher in a basin of warm water to take off the chill. When slightly warmed, place pitcher on tray.
2. At bedside, place the tray on the table.
3. Place the patient in an upright or modified Fowler's position, if permissible. Place the towel bib-fashion around his neck.
4. Remove the elastic band and gauze square from the tube while pinching off the tube. Check the position of the tube. Attach the syringe and aspirate gently to insure that the tube is in the stomach. Kink the tube against the tip of the syringe and remove the syringe bulb.
5. Pour a small amount of water into the syringe and allow this to run in slowly.
6. Pour the feeding slowly down the side of the syringe. Keep the syringe full until all of the feeding has been given.

CAUTION

Do not elevate the syringe above head height. Do not use force. Allow the feeding to run in by gravity alone. Kink the tube slightly to slow the flow p.r.n.

7. Follow up the feeding by pouring about 60 ml. of clear water in the syringe to rinse the tube.
8. Pinch off the tube and remove the syringe barrel. Cover the end of the tube with a clean gauze square, securing it with an elastic band.
9. Record feeding and amount of water given on I & O worksheet.
10. Rinse and return pitcher and glass to food service for sanitizing.
11. Rinse and return asepto syringe to CMS.

PROCEDURE (DRIP METHOD)

1. Use gastric feeding set (fig. 5–67) supplied by CMS and liquid feeding as ordered. With drip method, warming of formula is unnecessary.
2. Clamp tubing. Pour in required amount of formula from labeled container. Cover opening of flask with gauze fluff.
3. Suspend drip bottle from irrigating stand, unclamp tubing, and expel air. Attach adapter end of tubing to feeding tube.
4. Adjust clamp below drip chamber to deliver required number of ml. per minute. Observe at frequent intervals while feeding is being administered by drip method.
5. When required feeding has run out of the bottle, clamp the tubing and disconnect it from the nasogastric tube.
6. With an asepto syringe, gently introduce about 30 ml. of water to rinse the nasogastric tube. Clamp the tube. Cover the end with a clean gauze square.
7. Record feeding on I & O worksheet.
8. Discard the IV tubing. Rinse the bottle and return to CMS.
9. Use fresh bottle and IV tubing for each feeding; this will help prevent gastrointestinal upsets or diarrhea due to repeated use of inadequately cleansed feeding equipment.

5–81. Gastric Lavage

Gastric lavage is ordered to wash out the stomach. The doctor usually intubates orally and lavages the patient, but he may authorize a qualified enlisted specialist to perform both procedures. A Levin tube and a large asepto syringe may be used, or a large lumen, stiff-walled Ewald stomach tube with funnel attachment may be necessary.

The large-lumen tube is usually ordered when particles of food in the stomach are expected to be present, since these particles would occlude the lumen of a Levin tube.

EQUIPMENT

Nasogastric (Levin tube) or stomach tube, as ordered
Asepto syringe, 50 ml. size (if Levin tube is used)
Washbasin
Pitcher (approximately 8-quart size)
Lavage solution—warm water (100°–105°) or warm saline
Large rubber sheet
Bath towel
Safety pin
Paper tissues
Lubricant (for nasal insertion of Levin tube)
Emesis basin
Mouth wedge p.r.n. (2 tongue blades, padded with gauze and taped together)
Bucket
Newspaper or other protective floor covering

INTUBATION AND LAVAGE PROCEDURE

1. Screen the treatment area.
2. Tell the patient what is to be done and what he can do to help.
3. Check for and remove dentures. Place them in a labeled container in a safe place.
4. Position the patient sitting upright. If lying down, place in a left lateral recumbent position.
5. Drape the bedding and the patient with the protective rubber sheet. Pin the towel around the patient's neck.
6. Place the tube tray, pitcher of solution, and basin on a table convenient to the operator.
7. Place the bucket on the floor, on newspaper or other cover, at the operator's side of the bed.
8. Insert stomach tube orally:
   a. Find the circular marker indicating distance to be inserted. If marker is not visible, estimate distance by measuring on the tube the distance from the tip of the patient's nose around his ear and to the lower end of his sternum. Place a small strip of adhesive on the tube to mark this distance.
   b. Hold the tube 6 inches from its tip and rotate it to determine the position of greatest droop. Lubricate the tube by dipping in water.
   c. Ask the patient to tilt his head backward and to open his mouth wide.
   d. Place the tip of the tube far back in his mouth on the center of his tongue.
   e. Tell the patient to close his lips loosely on the tube, to tilt his head forward slightly, and to swallow. Insert the tube down into his throat as he swallows.
   f. Avoid force. With each swallow, insert the tube a few more inches.
   g. Observe the patient for coughing, choking, and cyanosis. If any of these occur, remove the tube immediately. Allow the patient to rest before attempting reinsertion.
   h. When tube is at marker, discontinue insertion.
9. Proceed with lavage:
   a. If patient is sitting upright in bed, lower the head of the bed. Have the patient lie on his left side with his mouth near the edge of the bed.
   b. Test for return of stomach contents before pouring any solution into tube. Hold basin below bed level and invert the funnel end of the stomach tube over the basin. Some stomach contents will drain by gravity. Save this first drainage for a specimen.
   c. Hold the funnel upright at mouth level. Pour solution slowly from the pitcher into the funnel. Keep the funnel full, but pour no more than 500 ml. at one time before draining stomach contents.
   d. Observe patient for cyanosis, increased respiration, gagging, and attempts to vomit. Pinch off the tube at the lips and remove it immediately if any of these signs occur. If patient vomits, support his chin in hyperextension to keep airway clear and prevent aspiration.
   e. Siphon back the gastric contents and lavage fluid: while fluid is still in the funnel, pinch off the tube immediately below the funnel; lower the tube and invert the funnel over the bucket. Release pinch-off and allow contents to drain into the bucket.
   f. Repeat steps c, d, and e above until the returns are clear or until the amount of solution ordered has been used.
10. Discontinue treatment:
   a. Pinch off the tube at the lips to prevent contents from spilling into the trachea.

b. Hold emesis basin at the chin.
c. Withdraw the pinched-off tube smoothly and quickly, placing it in the emesis basin.
d. Remove protective sheet and towel.
e. Assist the patient to rinse his mouth. Wash his face. Leave him clean and dry and as comfortable as possible.

11. Care for equipment and specimen:
a. Take all equipment to the utility room.
b. Measure and save initial drainage specimen for examination by the medical officer.
c. Measure total lavage return. Estimate amount of stomach contents obtained by subtracting known amount of lavage fluid from total. Record amount.
d. Discard lavage return in the hopper. Rinse and wash bucket and basin.
e. Rinse tube, flushing cold water through it repeatedly from the funnel end.
f. Wash rubber sheet, dry, and hang out to air.
g. Return all CMS equipment.

12. Record the procedure:
a. Type and amount of solution used.
b. Appearance, odor, and approximate amount (total minus lavage solution) of gastric return. Note if specimen was sent to laboratory.
c. Patient's toleration and reaction to the procedure. Make special note if the patient vomited or had any respiratory difficulty.

5-82. Gastrostomy Tube Feeding and Related Care

In a gastrostomy tube feeding, the patient is fed by a catheter introduced directly into the stomach through a surgical opening (gastrostomy). The gastrostomy procedure is done when disease or injury of the esophagus makes gastric intubation by way of the esophagus impossible. At the time of surgery, the gastrostomy tube, with usually a size 20 to 26 catheter, is inserted into the stomach by means of an incision; the distal end is clamped to prevent leakage, and the tube is secured at the incision with one or two sutures. As healing of the wound takes place, a stoma (artificial opening) is formed, and the catheter can then be removed and reinserted. Some patients are fitted with a plastic prosthesis ("belly button") instead of the catheter; the prosthesis remains in place and a catheter is inserted through its lumen for feeding; a screw cap or plug seals off the button opening when the catheter is not in use. Special attention must always be paid to the skin area around the tube since there may be some leakage of gastric secretions and unless the skin is kept clean and dry it will soon become very irritated. When the medical specialist does the gastrostomy feeding, he must also know how to carry out the prescribed skin care and dressing procedure. For the patient's morale, his feeding procedure should resemble as much as possible a normal meal procedure and not be an activity incidental to the dressing and skin care routine. For example, dressing and skin care materials should not be assembled on the same tray with his feeding set. When the time intervals for doing all required procedures coincide, plan to do the dressing and skin care procedures first, so that the patient is as clean, comfortable, and relaxed as possible for his meal.

DRESSING PROCEDURE

After the original surgical incision has healed, the dressing procedure for the stoma is usually done by nursing personnel, as a clean procedure, following the routine ordered by the doctor. A minimal number of dry, sterile compresses are placed around the tube, with the clamped end of the tube coiled on the surface of the dressing and secured in place with Montgomery straps.

Equipment

Sponge basin of warm soap solution
Sponge basin of warm water
Cotton balls, large
4- by 4-inch gauze compresses
ABD pad
Dressing set, with scissors
Emesis basin
Paper bag or newspaper
Towel
Plastic or rubber sheet
Instrument tray

Procedure

1. Assemble dressing equipment on instrument tray.
2. Screen the patient, place him flat in bed, turn the bed covers back to hip level, and adjust pajamas to expose gastrostomy dressing.
3. Place paper bag on newspaper and emesis basin at foot of bed. Place protective towel at left upper side of the patient.
4. Wash hands.
5. Open the dressing set.

6. Unfasten Montgomery straps. Support the gastrostomy tube with one hand to prevent any tension on the tube.
7. Using one forceps, remove dressing around tube. Inspect for tissue drainage and any sour-smelling leakage from the stoma before discarding.
8. Using the fingers, wash the skin around the stoma with cotton balls and soap solution; then rinse with cotton balls and water. Pat skin dry with gauze compresses. Note any signs of irritation or any complaints from the patient of soreness or tenderness in the tube area.
9. Place dry 4- by 4-inch compresses, slit halfway, around the tube. Reinforce with one ABD pad, also slit halfway.
10. Coil clamped end of tube on surface of ABD pad, with no tension on the tube.
11. Secure dressing and clamped end of tube with Montgomery straps.
12. Make the patient comfortable.
13. Remove dressing equipment. Discard waste. Wash hands. Reassemble tray for next dressing. Return clean tray to patient's unit.

FEEDING PROCEDURE

Equipment

Food service tray with tray cover
China pitcher (500 ml. capacity), 2
Tablespoon
Container of formula
Asepto syringe barrel or small funnel
Basin of warm water

Procedure

1. Wash hands.
2. Stir formula in container with spoon. Pour prescribed amount into one china pitcher. Place the pitcher in warm water to take chill off.

NOTE

Formula must be obtained from labeled, refrigerated container provided by food service.

3. Pour measured amount of tap water into second pitcher.
4. Place slightly warmed formula pitcher, spoon, water pitcher, and asepto syringe on food service tray.
5. Prepare patient. Provide handwashing basin, and assist him to wash his hands. Explain to him how he will assist with his feeding; *for example,* with holding his tube or syringe, pouring formula, etc.
6. Screen the patient. Place him in low gatch position if in bed. Fold back covers. Open pajama to expose gastrostomy.
7. Unfasten Montgomery straps to release the coiled catheter. Leave clean dressing undisturbed.
8. Support the catheter in upright position, with no tension on it. Unclamp the catheter, while pinching it off. Place the clamp within hand reach on the tray at the bedside.
9. Insert the syringe, without the bulb, into the catheter, kinking off the catheter against the inserted tip. (Show the patient how to hold the syringe and catheter in this position.)
10. Tilting the syringe at a slight angle, pour in about 15 ml. of water (about half a syringe).
11. Release the kinked catheter and allow water to flow in slowly. Before the syringe is empty, pour in formula, allowing it to flow slowly by gravity.

NOTE

Thickened formula may require slight pressure from the syringe bulb.

12. When all formula is given, but before the syringe is completely empty, pour water into the syringe to clear the catheter.
13. Remove syringe while pinching off catheter. Reapply the clamp.
14. Coil the tube on the top surface of the dressing and refasten the Montgomery straps.
15. Make the patient comfortable. Remind him to lie quietly on his back or to turn slowly toward his right side, if that position is more comfortable. Open the curtains or remove screens.
16. Remove feeding tray. Measure amount of water remaining and record amount of water and formula given on I & O worksheet.
17. Rinse utensils with cold water. Return pitcher and spoon to food service, the syringe to CMS.
18. Reset feeding tray with clean cover and clean utensils.
19. Check patient. He should not feel overly fed or nauseated. Report these symptoms stat—the feeding may require adjustment in amount or frequency if the patient has gastric distress.
20. Plan to give water between feedings, at regular intervals; record all water given on I & O

record. Instruct patient how to do this if he can participate in self-care.

Mouth Care

The teeth and mouth of a patient with a gastrostomy must be kept in optimum condition by frequent, regular, oral hygiene measures. Sometimes chewing gum is permitted to stimulate flow of saliva and to keep the mouth moist. If the patient is unable to swallow even saliva, a covered, plastic or other disposable sputum container should be provided and changed frequently. Measurement of expectorated saliva is an important part of the patient's output record.

5-83. Colostomy Irrigation and Dressing

A colostomy is the forming of a stoma (artificial opening) into the colon. It may be temporary or permanent.

a. Patient Needs. A colostomy, temporary or permanent, is very distressing to the patient. He requires encouragement, understanding, and assistance to overcome his fear and distaste for the colostomy and to become independent and self-sufficient in its care before he leaves the hospital if this is part of his planned medical care. His training should be started as soon as practicable after surgery; the exact time, however, varies with each patient. Keeping the patient clean, dry, and odor free is essential. The ease and skill with which the nursing personnel are able to care for the colostomy are especially important in helping the patient physically and emotionally. The patient and his family learn during this period that the colostomy can be managed and that a full, active life can be anticipated.

(1) *Temporary colostomy.* The temporary colostomy is usually done for diversion of fecal material following intestinal repair or in preparation for further surgery. A loop of the colon is brought through the abdominal wall above the skin surface and two openings are made in the colon (a, fig. 5-68). The opening into the proximal loop leads to the functioning part of the gastrointestinal tract, and will discharge feces and flatus. The opening into the distal loop leads to the nonfunctioning colon and rectum; the distal loop will discharge mucous or serous secretions.

(2) *Permanent colostomy.* The permanent colostomy (b, fig. 5-68) serves as an artificial anus for the remainder of the patient's life and is done in conjunction with the removal of the lower bowel and the rectum. There is no sphincter control, but bowel movements through the stoma may be controlled by daily habits of living, which will include irrigating at regular intervals.

b. General Nursing Measures. To help the patient to become independent and self-sufficient in the care of the colostomy when he leaves the hospital, follow these rules—

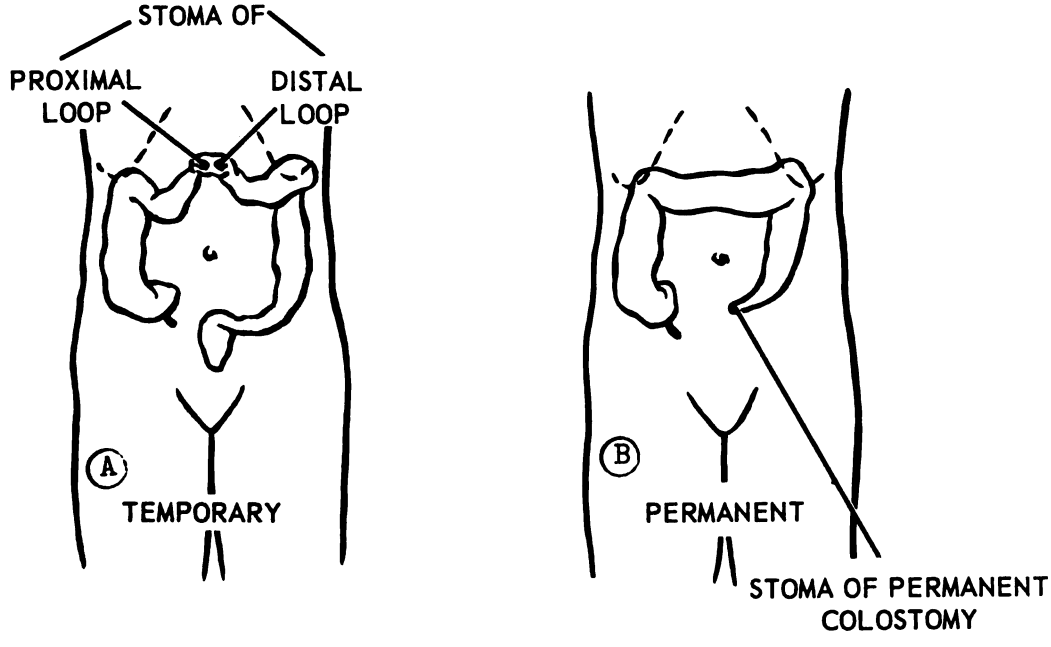


Figure 5-68. Colostomy (A) temporary and (B) permanent.

(1) Insure complete privacy for the patient when caring for the colostomy.

(2) Encourage the patient to look at the colostomy and to assist with the dressing in order to gradually overcome his distress. The first step may be to have the patient place clean fluff dressings on the cleansed area. From this point, he can work backward to cleansing the area with the soap sponges. Teach him how to care for the skin around the stoma. Cleanliness and protection from digestive enzymes in the fecal drainage will prevent excoriation (raw skin surfaces).

(3) As soon as possible, plan to do the irrigation in the bathroom with the patient seated on the toilet. This emphasizes the return to normal habits of evacuation. (The local hospital will normally supply the patient with an irrigating kit (fig. 5–69) and a disposable plastic bag device which will fit over the stoma.)

(4) Take an active interest in how the patient is progressing toward a regular, well-balanced diet. The individual's experience in regulating the colostomy will be the best guide for selection of food. He will find that some foods cause loose stools or produce excessive amounts of gas, and he will learn to avoid these. Encourage him to ask questions of the dietitian and to follow dietetic recommendations when selecting foods on his diet slip.

(5) Be interested in him as a person who incidentally happens to have a colostomy. Do not permit care of the colostomy to dominate his overall nursing care.

c. Explanation of Procedure for Irrigation and

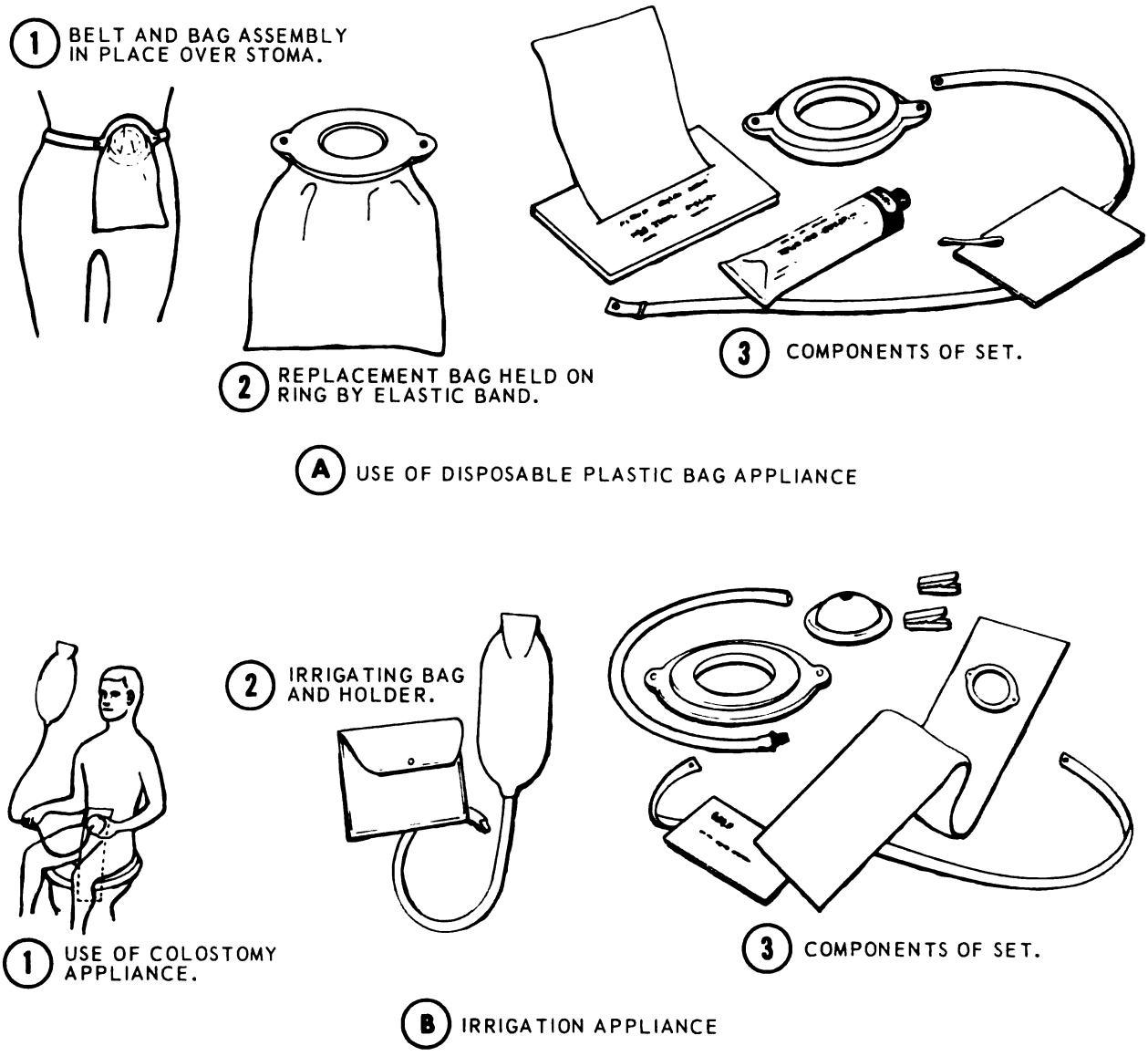

1 BELT AND BAG ASSEMBLY IN PLACE OVER STOMA.
2 REPLACEMENT BAG HELD ON RING BY ELASTIC BAND.
3 COMPONENTS OF SET.
A USE OF DISPOSABLE PLASTIC BAG APPLIANCE
1 USE OF COLOSTOMY APPLIANCE.
2 IRRIGATING BAG AND HOLDER.
3 COMPONENTS OF SET.
B IRRIGATION APPLIANCE

Figure 5–69. Use of colostomy appliances.

Dressing. The procedures discussed are those for the early convalescent period while the patient is learning to be self-sufficient. The purposes of the procedures are to cleanse the colon; to establish regularity; to keep the patient clean, dry, and odor free; and to prevent excoriation of the skin around the stoma.

(1) *Irrigation procedure.* The medical officer prescribes the solution (usually tap water), the interval (usually daily), and the occasion, if there are 2 loops, when the distal loop is to be irrigated.

(2) *Dressing procedure.* After the incision has healed, the dressing is a nursing responsibility. Clean dressing materials are assembled on a tray and kept at the bedside. Dressings are changed as often as necessary; soiled dressings are removed from the patient's area stat. Fluff gauze is used over the stoma because it is more absorbent than compresses, and ABD pads are placed as the external dressing. The amount of drainage between irrigations is the determining factor for the dressing requirement; *for example,* drainage from a colostomy which is proximal to the small intestine will be more profuse and more irritating to the skin than will drainage from a colostomy that is located more distal to the ileum.

(3) *Use of gloves.* Plastic or rubber gloves may be used when drainage is very profuse and the dressing and irrigation procedures are unusually messy. The gloves should be eliminated when possible to help the patient overcome his sensitivity to this so-called "dirty" procedure.

(4) *Handwashing.* The patient should always be provided with handwashing facilities when he assists with his own dressing and irrigation. Personnel can help reinforce good habits in patients by consistent demonstration of their importance.

d. Individual Dressing Tray Equipment. Suggested items to be kept available at the bedside of a patient with an unregulated colostomy include the following:

Tray, instrument, CRS
Large cotton balls, pkg
Fluff gauze, pkg
4- by 8-in. gauze, pkg
ABD pads, small, pkg
Applicators, cotton tipped
Solution bowls, CRS, 2
Stoma bag device (commercial)*
Protective ointment or spray, as prescribed
Tissues, facial or toilet
Paper bags
Plastic gloves, disposable, pkg.
Plastic-backed pads
or
Small rubber treatment sheet
Montgomery straps, 2 pr.
Surgical soap, plastic container

* Stoma bag device, when available, includes a supply of plastic disposable bags to be used instead of gauze dressings. Skin care around the stoma continues to be essential.

e. Irrigation Equipment. The colostomy irrigation tray is similar to the routine enema tray, with size of the catheter determined according to individual patient requirements; sizes 16 or 18 Robinson (round tip) catheters are often used. When a commercial irrigating device is not available, assemble the following items for a colostomy irrigation:

Enema tray, as above
Solution, as ordered
Emesis basin
Bedpan, with paper cover
Surgical lubricant
Finger cot
Irrigating stand
Handwashing basin, soap, towel
Plastic-backed paper pads
or
Rubber treatment sheet with cover

PROCEDURE

1. Provide privacy. The entire procedure is lengthy (one hour or more).
2. Set up equipment at bedside. Adjust irrigating stand so that the irrigator will be suspended about 18 inches above the stoma. Place both dressing and irrigating trays so they will be convenient to use.
3. Turn patient toward side of stoma. Elevate head gatch about halfway.
4. Place protective sheet or pad so as to protect the bedding.
5. Remove soiled dressings. Place immediately in paper bag for disposal.
6. Cleanse skin and stoma gently with cotton balls (which are less irritating to the skin and mucous membrane than gauze squares) and soap and water. Use moistened applicator sticks p.r.n. to cleanse crevices around stoma and skin edges. Use a dilute soap solution and rinse with tap water. Pat dry with gauze.
7. Dilate stoma, if ordered. This procedure prevents shrinkage of the stoma as it heals.

NOTE

Instruct the patient how to do it when he is ready for self-care.

Insert forefinger covered with a well-lubricated finger cot gently into opening. Never use force. Gently rotate the finger in the opening for about 1 minute.

CAUTION

If finger cannot be inserted easily, notify head nurse or doctor.

8. Irrigate colostomy.

a. *Proximal loop procedure.*

(1) Place the bedpan at the patient's side to catch the return flow. Fit the curve of the bedpan to the patient's side. Do not attempt to use a small emesis basin.

(2) Lubricate the end of the catheter liberally.

(3) With the catheter over the bedpan, unclamp tubing and allow a small amount of solution to run through to expel air. Pinch tubing and position catheter at stoma.

(4) With the solution running, insert the catheter gently into the stoma and advance it into the proximal loop about 4 to 6 inches.

(5) Allow about 500 to 700 ml. of solution to enter the colon slowly. If cramps result, stop the irrigation temporarily. Feces may start to return before all solution runs in.

(6) Before withdrawing the catheter, shield the area from forceful expulsion of fluid and feces by holding an ABD pad just above the stoma. Pinch the catheter and withdraw it while the bottom of the irrigator still contains some solution.

(7) Allow 20 to 30 minutes for return of fluid and feces. Make the patient as comfortable as possible. If necessary to leave bedside area, leave signal cord within reach.

(8) Return upon signal and remove and discard bedpan contents.

(9) Cleanse skin and stoma. Apply protective ointment or spray to clean, dry skin.

NOTE

An aluminum-base ointment or silicone spray may be ordered. These preparations are sometimes difficult to remove as required for adequate skin cleansing. However, an effective way to remove residue is to wipe gently with mineral oil. Apply fluff gauze in adequate numbers. Cover with ABD pad. Secure Montgomery straps, check skin area on which straps are applied; always remove soiled straps and replace with clean.

(10) Leave patient in comfortable position.

(11) Remove and clean all equipment. Clean and reset patient's dressing tray; return tray to bedside, ready for use. Place patient's name on irrigating tray and store in utility room, replacing irrigator and catheter from CMS.

(12) Record treatment, results, and condition of skin and stoma on nursing notes.

b. *Distal loop irrigation.*

CAUTION

This is done only on doctor's order.

(1) Place patient on a bedpan.

(2) Lubricate the end of the catheter liberally. Insert lubricated catheter gently into distal stoma as in the proximal loop procedure.

(3) Allow prescribed amount of solution to enter slowly. Remain with the patient while it is expelled through the rectum. Use the emesis basin if some solution returns through the stoma. If severe cramping occurs, stop the procedure.

(4) After removing the bedpan, turn patient on side and wash and dry the anal area.

(5) Note and report returns from distal loop.

Section VIII. THERAPEUTIC PROCEDURES—GENITOURINARY TRACT

5-84. Catheterization of the Urinary Bladder

Catheterization is the insertion of a catheter through the urethra into the urinary bladder to withdraw urine. Because of the danger of introducing infection or producing injury by faulty technique, local policy may require that the procedure be done only by a doctor or professional nurse. If this is not the policy, only the fully qualified enlisted specialist is usually authorized to catheterize a patient and he must be supervised. **Without exception, catheterization is done only on order of the medical officer, and aseptic technique is essential.** Male patients are catheterized by a doctor, a male nurse, a clinical specialist, or a trained male medical specialist; female patients by a doctor, a female nurse, a female clinical specialist, or a trained female medical specialist.

EQUIPMENT

Catheterization tray, sterile (See note)
Gloves, sterile
Skin detergent-disinfectant solution, as prescribed
Flask of sterile water p.r.n.
Lubricant, surgical, sterile
Emesis basin, unsterile
Protective sheet and cover for the bed, or plastic-backed paper pad
Protective drape sheet for the patient
Transfer forceps
Specimen label and laboratory request form (SF 514a (Urinalysis, and SF 514k, Bacteriology) if specimen is sent for culture and sensitivity)
Floor lamp, adjustable
Portable screen p.r.n.
Kelly forceps p.r.n.

NOTE

A commercially packaged stock item set may be used (fig. 5-70Ⓐ) or a standard catheterization set may be assembled in CMS (fig. 5-70Ⓑ); in addition, a Foley retention catheter and drainage set (fig. 5-70Ⓒ) may be required. Obtain sterile equipment from CMS.

PROCEDURE

Male Catheterization

1. Assemble equipment in the workroom.
2. Take the drape sheet, protective sheet, and floor lamp to the patient unit.
3. If the patient is weak or irrational, arrange to have an assistant, since vigilant support is needed if the patient cannot cooperate or respond to instructions.
4. Explain the procedure briefly to the patient and state that there will be no pain—only a slight discomfort.
5. Screen the unit.
6. Place patient in supine position. Remove pajama trousers. Cover him with the drape sheet and fold back top bedding to his knees. Place covered protective sheet under his buttocks and upper thighs.
7. Place the lamp on the far side of the bed, adjusting the light to shine on the perineal area.
8. Provide a convenient work area toward the foot of the bed. Move the bedside stand to this position or, if no other alternative is possible, use the foot of the bed.
9. Go back to workroom. Wash hands.
10. Maintaining aseptic technique, uncover the sterile tray. Use hands for the corners of the outer wrapper; use transfer forceps for handling all inner contents.
11. Pour the prescribed detergent-disinfectant solution (usually a 1:1000 solution of benzalkonium chloride (zephiran) or 2-percent surgical soap) over four cotton balls in the solution bowl. (If surgical soap is used, pour sterile water into the solution cup or medicine glass.)
12. Squeeze a liberal amount of surgical lubricant on a 4- by 4-inch gauze sponge.
13. Maintaining aseptic technique, recover the tray.
14. Carry the prepared tray, transfer (or Kelly) forceps, sterile glove package, and the emesis basin to the patient unit. Place this equipment on the prepared work area.
15. Fold back the drape sheet to expose the patient's pubic area and thighs. Tell the patient to keep his hands above his head. Encourage him to relax and to breathe slowly and regularly to reduce tension. Separate his thighs slightly.
16. Adjust the light.
17. Place the unsterile emesis basin on the protective sheet on the operator's side of the near leg away from the sterile field. This is for waste.
18. Uncover the tray. Using transfer (or Kelly) forceps, remove the sterile folded towel. Grasping one corner in each hand, open the

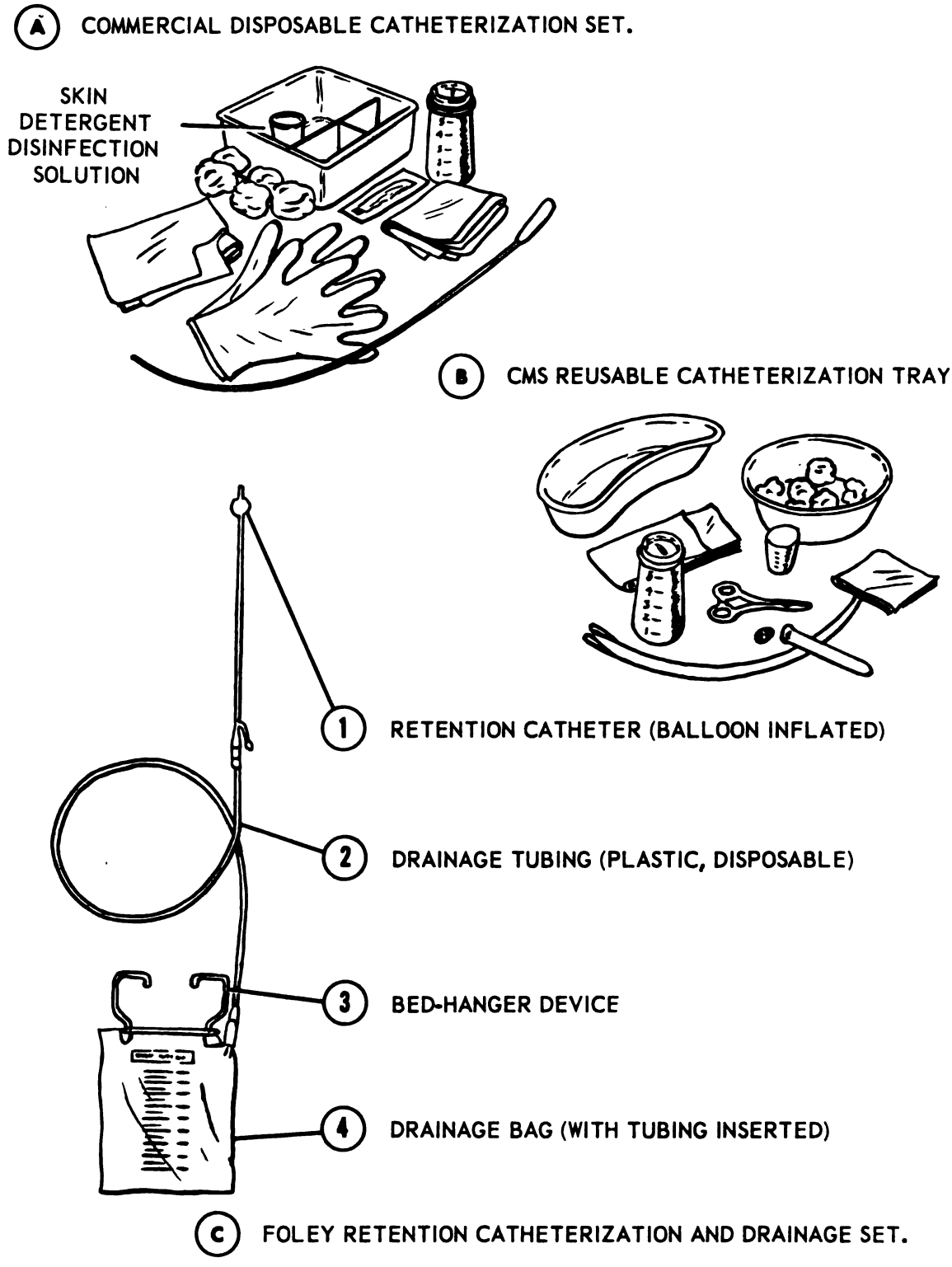


Figure 5-70. Examples of catheterization sets.

towel. Place it across the lower thighs well away from the pubic area. Use care to protect the exposed sterile surface.

19. Put on sterile gloves.
20. Cleanse the urinary meatus in the following manner: With the gloved left hand, grasp the penis just behind the glans with thumb and forefinger and retract the prepuce (foreskin). Maintain this support of the penis until the catheter has been introduced and the urine starts to flow.
21. With the gloved right hand, pick up the Kelly forceps from the tray, and using the forceps and one saturated cotton ball at a time, cleanse the meatus and the glans. Do not contaminate the right hand. Start at the meatus and make one circular motion with each of the four cotton balls, discarding each one as used into the waste basin. (If surgical soap is used, follow the cleansing with water-saturated cotton.) Discard the forceps into the waste basin.

NOTE

An alternate method of cleaning eliminates the use of the Kelly forceps. This means that the right hand would be contaminated. In this case, change gloves after cleaning process.

22. Being especially careful not to contaminate the gloved right hand, carefully pull the sterile towel up into position over the scrotum and under the shaft of the penis.
23. Pick up the sterile basin from the tray and place it on the sterile towel.
24. Pick up the appropriate size catheter, holding it about 3 inches from the tip (fig. 5–71). Loop excess, supporting it with the right-hand fingers. Lubricate the tip liberally.

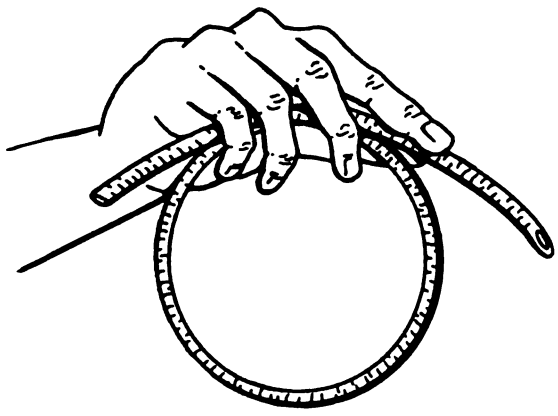


Figure 5–71. Holding urethral catheter.

25. With the left hand supporting the glans, elevate the penis to a 60-degree angle to the pubis. Maintain gentle traction on the penis while inserting the catheter.
26. Insert the lubricated tip into the meatus, using gentle, steady pressure. Increase the pressure slightly when slight resistance is felt as the catheter advances through the urethra (fig. 5–72Ⓐ); this resistance point is at the internal sphincter. As the catheter again advances, lower the penis (fig. 5–72Ⓑ) and insert the catheter into the bladder. Urine will begin to flow. Do not insert the catheter more than a total of 7 inches.

CAUTION

Do not attempt to force the catheter if continued resistance is felt to initial gentle, steady pressure; there may be a stricture (abnormal narrowing) of the urethra along the shaft of the penis or at the prostatic juncture. If difficulty is encountered, withdraw the catheter and notify the head nurse or doctor stat.

27. Direct the urine flow into the sterile basin.
28. If a specimen is required, collect approximately 120 ml. (after the initial flow) into the specimen bottle from the tray.

CAUTION

Hold the bottle at the bottom. Do not touch the catheter with the bottle. Place the collected specimen on the tray and cover it with the sterile cap.

29. When urine ceases to flow, pinch off the catheter and gently withdraw it. Replace the retracted foreskin p.r.n.

Female Catheterization

1. Assemble equipment in the workroom.

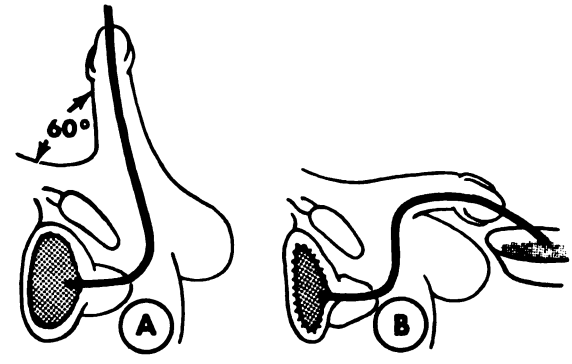


Figure 5–72. Inserting the catheter (male).

2. Take the drape sheet, protective sheet, and floor lamp to the patient unit.
3. If the patient is weak or irrational, arrange to have an assistant, since vigilant support is needed if the patient cannot cooperate or respond to instructions.
4. Explain the procedure briefly to the patient; state that there will be no pain, only a slight discomfort.
5. Screen the unit.
6. Put patient in supine position. Place the drape sheet in a diamond shape over her (fig. 5–32), with the top corner at her chin and the bottom corner toward the foot of the bed. Fold the top bed clothes to the foot of the bed.
7. Place patient in dorsal recumbent position (knees flexed, thighs separated, feet flat on the mattress). Drape her thighs and legs with the right and left corners of the sheet, tucking the free edges under her feet.

NOTE

Do not fold back the bottom corner to expose the vulva until ready to start the catheterization.

8. Place the lamp on the far side of the bed, adjusting light to shine on the perineal area.
9. Provide a convenient work area toward the foot of bed. This may be the bedside stand or, if no other alternative is possible, the foot of the bed.
10. Go back to the workroom. Wash hands.
11. Maintaining aseptic technique, uncover the sterile tray. Use hands for the corners of the outer wrapper; use transfer forceps for handling all inner contents.
12. Pour the prescribed detergent-disinfectant solution over four cotton balls in the solution bowl. (If surgical soap is used, pour sterile water into the solution cup or medicine glass.)
13. Squeeze a liberal amount of surgical lubricant on a 4- by 4-inch gauze sponge.
14. Maintaining aseptic technique, recover the tray.
15. Carry the prepared tray, transfer forceps, sterile glove package, and the emesis basin to the patient unit. Place this equipment on the prepared work area.
16. Fold back the drape sheet to expose the vulva. Encourage patient to relax and to breathe regularly and slowly to relax tension.
17. Adjust the light.
18. Place the unsterile emesis basin on the protective sheet on the operator's side of the near leg away from the sterile field.
19. Uncover the tray. Using transfer forceps, remove the sterile folded towel. Grasping one corner in each hand, open the towel. Place the sterile towel between the patient's thighs, pulling the top edge just under the buttocks. Use care to protect the exposed sterile surface.
20. Put on sterile gloves.
21. With the gloved left hand, separate the labia to expose the urinary meatus (fig. 5–73).

NOTE

If there is edema of the vestibule, the meatus may be difficult to identify; it should be visible as a small opening about ¼ inch above the vagina.

Keep left hand in position, holding the labia apart until the catheter has been inserted. Remember, the left gloved hand is no longer sterile.

22. With the right gloved hand, pick up the forceps from the tray. Using the forceps, pick up a saturated cotton ball from the four balls in the solution basin and with no retracing, cleanse the meatus and vestibule from above downward. Discard each cotton ball in the waste basin. Discard forceps into the basin following use of the last cotton ball.
23. With the gloved right hand, pick up the sterile basin and place it on the sterile towel, close to the buttocks and below the separated labia.

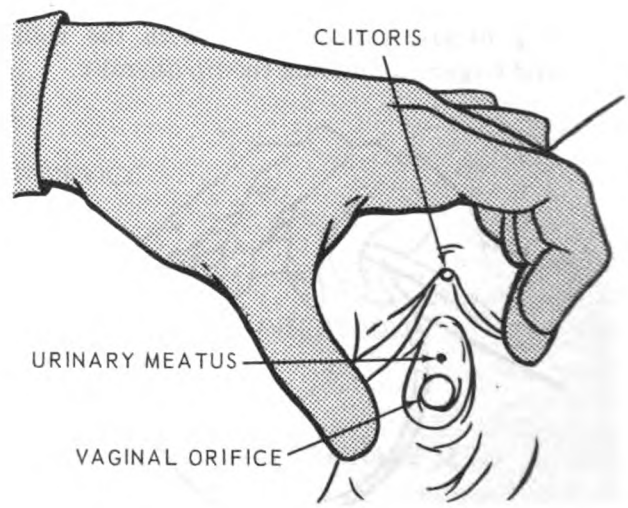


Figure 5–73. Separation of labia.

24. With the gloved, sterile right hand, pick up the catheter, holding it about 3 inches from the tip (fig. 5–71). Lubricate it.
25. Insert the catheter into the meatus about 2 inches, or until the urine starts to flow. Do not use force if there is resistance. Do not insert more than 2 inches.
26. Direct the urine flow into the sterile basin.
27. If a specimen is required, collect approximately 120 ml., after the initial flow, into the specimen bottle from the tray.

CAUTION

Hold the bottle at the bottom. Do not touch the catheter with the bottle. Place the collected specimen on the tray and cover it with the sterile cap.

28. When the urine ceases to flow, pinch off the catheter and gently withdraw it.

CARE OF PATIENT AND EQUIPMENT AFTER CATHETERIZATION

1. Place the catheter and the basin of urine on the tray. Remove all other equipment from the bed.
2. Leave the patient dry, covered, and comfortable.
3. Remove all equipment from the bedside. Measure total amount of catheterized urine. If a laboratory specimen is required, identify the specimen as "catheterized" on the laboratory request form.
4. Clean up equipment. Discard disposables and rinse and return reusables to CMS.
5. Record procedure and total amount of urine obtained.
6. Send properly identified specimen to the laboratory p.r.n.

5–85. Retention (Indwelling) Catheterization and Urinary Bladder Drainage

A retention (indwelling) catheter is ordered to permit continued drainage of the urinary bladder without repeated catheterization. The catheter commonly used is a self-retaining urethral catheter (Foley type, fig. 5–70©). This has a double lumen, with one opening for drainage and the other for inflation of the retention device, which is a small balloon at the tip of the catheter. The retention balloon is inflated with a measured amount of sterile water (or air) following its placement in the bladder. When a retention catheter is used, provision is usually made for bladder drainage by means of a drainage tubing connected to a urine collecting bottle or a plastic drainage bag. The policy may be that only a medical officer or nurse inserts and inflates the retention catheter. Following insertion of the catheter, it is usually a nursing responsibility to set up and maintain the drainage system. Aseptic technique in maintaining urinary drainage is required since the patient is exposed to a source of chronic irritation from the indwelling catheter and is therefore more susceptible to any source of infection.

EQUIPMENT

NOTE

A sterile, commercially prepared, stock item, disposable catheterization pack for use in inserting an indwelling catheter may be available. This pack differs from the routine catheterization pack, containing a self-retaining catheter, a syringe and a plastic drainage tubing set (fig. 5–70©). When this commercial item is not available, use the basic catheterization tray obtained from CMS, plus the following additional items:

Self-retaining catheter, designated size (usually number 16 to 18 French)
Sterile water
Sterile syringe, 10 ml.
Sterile hemostat
Surgical thread (if catheter does not have self-sealing device)
Gauze compress, dry, sterile, 2 by 2 inches
Adhesive tape
For straight (gravity) drainage add:
Sterile drainage tubing and bottle set (plastic disposable or CMS reusable)
Safety pins
Rubber bands
Drainage bag holder

PROCEDURE FOR PLACEMENT OF RETENTION CATHETER

1. Assemble the equipment as for the catheterization procedure.
2. Prepare the patient as for the catheterization procedure (para 5–84).
3. Using aseptic technique, complete preparation of the catheterization tray, adding p.r.n. the sterile syringe, sterile water, sterile self-retaining catheter of required size, 2- by 2-inch gauze, and hemostat.

4. Prepare to catheterize the patient, but first do this step immediately after putting on the sterile gloves—
   a. Using sterile gloved hands, check retention catheter for defects by injecting the specified amount of sterile water into the balloon lumen. The capacity of the balloon is written on the catheter.
   b. Deflate the balloon before proceeding with the catheterization.
5. Insert the catheter as for a routine catheterization.
6. Inflate the catheter balloon after inserting the catheter. Inject the required amount of sterile water (or air) into the balloon lumen. Clamp off the balloon lumen temporarily with the hemostat before disconnecting the syringe. Insert the self-sealing lumen device, if available. If this sealing-off plug is not used, close off the balloon lumen by fastening it securely with surgical thread. This closure is preferable to continued use of a clamp which may cause injury through continued pressure on the patient's skin. When properly positioned and inflated, the balloon lies within the bladder at the bladder outlet, not in the urethra.
7. Clamp off the catheter and protect the open drainage lumen temporarily. Cover the end of the catheter with a dry sterile gauze square, and fasten it with an elastic band.
8. Secure the catheter in place with adhesive.
   a. For female patients, anchor the catheter to the skin of the inner thigh, placing the adhesive toward the groin.
   b. For male patients, use the thigh also unless the medical officer specifies that the penis is to be positioned upward on the pubis, with the catheter anchored to the lower abdomen; this position helps prevent urethral edema.
9. Connect the catheter to the urinary drainage tubing and drainage bottle, maintaining sterility of the drainage system.
   a. Connect the open end of the drainage tubing to the catheter. Use glass or clear-plastic connecting tubes so that the color of the draining urine can be observed. (The collected urine in the collecting bottle undergoes changes as it becomes stale, and therefore its appearance is less reliable.)
   b. Unclamp the catheter.
   c. Adjust tubing from the catheter to the drainage bottle so that there are no kinks and no loops of tubing extending below the level of the entrance of the tubing into the bottle (fig. 5–74). This is essential for effective gravity drainage.
   d. Check the air-vent opening in the bottle or plastic bag closure. The vent must be open to insure drainage from the closed body cavity (the bladder).
   e. Loop an elastic band around the drainage tubing, and pin this loop to the foundation bedsheet. There should be no strain on the catheter and just enough length of tubing (about 40 inches) to enable the patient to turn and move freely.
   f. Place the drainage container at the designated level below the bedframe. Secure a plastic container in a standard wire holder, suspended from the bed. If no holder is available for a glass bottle, suspend it by tying it to the bedframe with loops of bandage. As a general rule, do not place the urinary system drainage bottle on the floor, because the length of tubing leading from the bladder would be excessively long and cause too much pressure within the bladder.

FOLLOWUP CARE

The retention catheter and drainage system may be continued for days, weeks, or indefinitely. As a general rule, the retention catheter is changed weekly, or as ordered by the medical officer. Daily continuing care of the patient and the equipment includes the following essentials:

1. Maintain an accurate intake and output record. Unless otherwise ordered, encourage the patient to drink at least 3000 ml. fluids daily to provide an effective "internal irrigation" system for the bladder, catheter, and drainage tubing.
2. Observe the tubing and catheter connections frequently for kinks, and make sure the patient is not lying on the tubing. This both obstructs drainage and causes undue pressure area on the skin.
3. Maintain cleanliness and protect the urethral meatus. This requires direct observation and specific hygiene measures. Wash the perineal area carefully, from front to back. Cleanse the urinary meatus around the catheter with sterile sponges moistened with prescribed disinfectant-detergent solution. Remove secretions of mucus and other discharges gently but thoroughly to help reduce irritation and possible

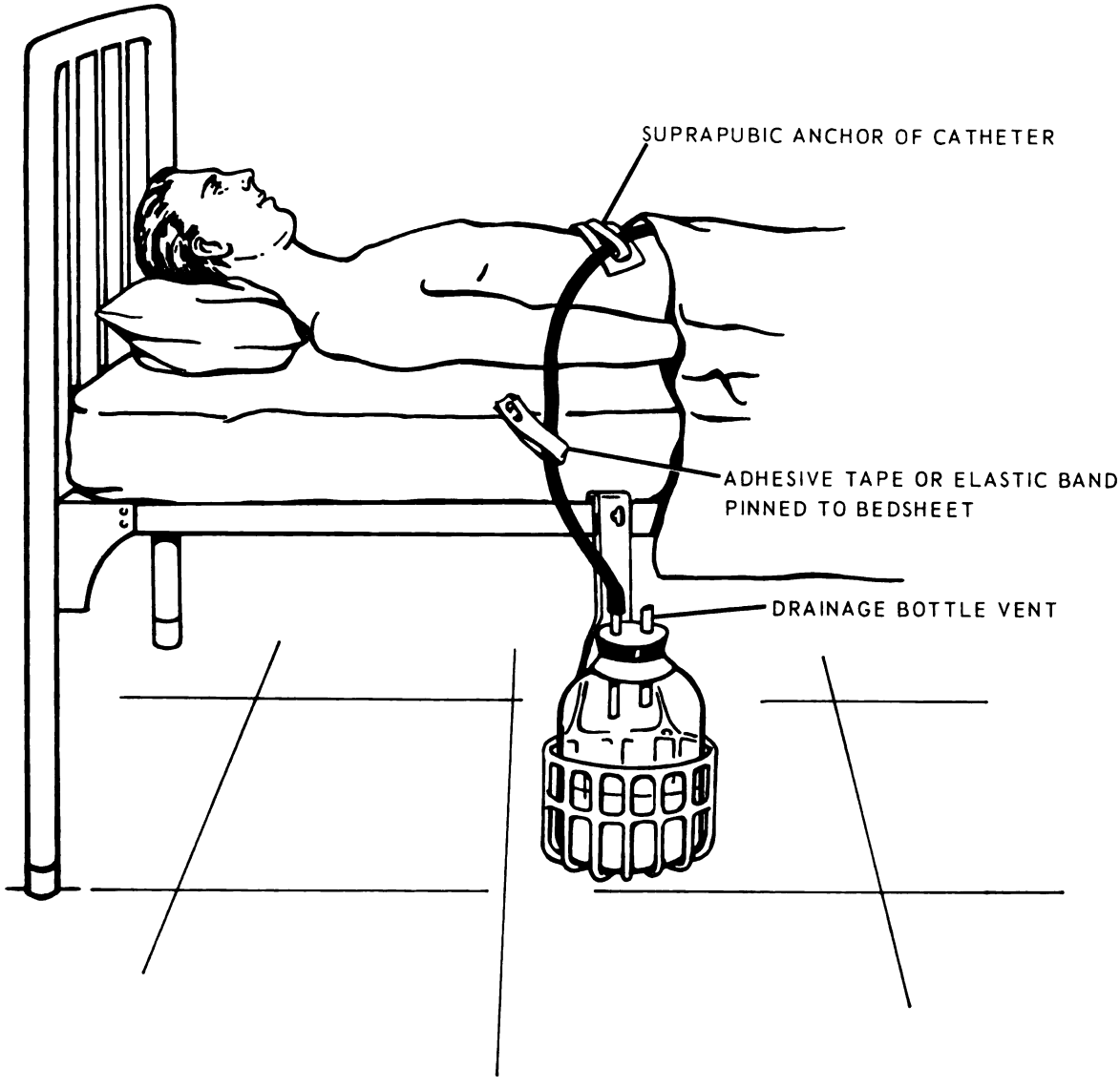


Figure 5-74. Urinary drainage, gravity method.

infection. An antibiotic ointment such as bacitracin may be ordered to be applied to the cleansed meatal area around the catheter.

4. Replace the drainage set (tubing, connector, and bottle) with a sterile one daily to reduce bacterial growth and odor.
5. Measure and record the collected output. Never permit the drainage bottle to become more than three-fourths full in order to prevent any possibility of the tubing outlet becoming immersed in the draining urine.
6. Use aseptic technique in disconnecting the catheter from the drainage tubing. Disconnection is necessary when the drainage set is replaced, a specimen is collected, or the catheter is irrigated.
   a. Wash hands.
   b. Before disconnecting, clamp the catheter. (A hemostat clamp may be used, with the tips rubber shod (covered with rubber tubing) to prevent damage to the catheter. Hemostat clamps for this purpose are obtained as discards from CMS or the OR.) Be sure to unclamp the catheter after reconnecting it to the drainage tubing.
   c. As the catheter is disconnected, wipe the end of both the catheter and the connector with an individual germicide-saturated sponge. Cover the ends of both catheter and connector with a dry, sterile sponge, securing each with a rubber band. Do not allow the drainage tubing to fall to the

floor. If this should occur, the tubing is contaminated and must be replaced.

7. Provide continued gravity drainage for the ambulating patient. The patient may carry the drainage bottle, or a smaller plastic collecting bag may be strapped to his leg. Check to see that the tubing is not excessively long and looped below the level of the bottle when he is standing upright. Readjust and reconnect the drainage tubing when the patient returns to bed.
8. To collect a urine specimen from the patient with a retention catheter, obtain the urine from the catheter, not the tubing or drainage bottle. Collect the required amount in a sterile collection bottle. Record this amount on the I & O worksheet.

REMOVAL OF RETENTION CATHETER

Change the catheter on order, usually at least once weekly. The order may be to remove the catheter and then to replace it following several hours interval to relieve pressure on the urethra. Remember—

1. Always deflate the balloon of a self-retaining catheter before removal.
2. Use aseptic techniques for any procedure involving the urethra and bladder. Each catheterization is a potential source of injury and infection if not performed properly.

5–86. Irrigation of the Bladder and Retention Catheter—Open Method

Irrigation of the bladder and retention catheter is ordered primarily to wash out the catheter and prevent obstruction. Bladder irrigation through the retention catheter is done by two methods: open irrigation, using an asepto syringe, and closed (intermittent) irrigation, using a sterile irrigating flask and tubing system. The open method is usually ordered when the irrigation is to be done a few times only; the closed method is ordered when the irrigation is required at scheduled intervals for a catheter remaining in place over a period of several days or longer. Both open and closed methods are sterile procedures and both must be done gently to prevent injury and spread of infection within the bladder.

EQUIPMENT

Sterile asepto (bulb) syringe, 30 ml.
Sterile solution basin
Flask of prescribed sterile solution
Sterile towel
Sterile sponges, germicide-saturated and dry, to protect connector
Hemostat, rubber-shod
Gauze compresses, 2- by 2-inch
Elastic bands
Emesis basin

PROCEDURE

1. Open the sterile packages. Pour the prescribed solution, which must be at room temperature, into the basin. Fill the asepto syringe.
2. Open the sterile towel halfway. Place to one side of the catheter-connector attachment.
3. Clamp off the catheter, detach the connector, and place the end of the catheter on the sterile towel. Protect the open connector with the gauze sponge and rubber band.
4. Insert the tip of the asepto syringe into the catheter. Unclamp the catheter. Allow the solution to run in slowly with only gentle pressure on the syringe bulb. Refill syringe once or twice, pinching off the catheter while removing and replacing the syringe. Unless otherwise ordered, allow 50 to 100 ml. of solution to flow into the catheter at one time. Do not aspirate the irrigating fluid back unless ordered to do so. To check return flow, pinch the catheter closed, remove the syringe, and invert the end of the catheter over the emesis basin. Continue irrigation until the return is clear.
5. Reconnect the catheter to the tubing. Observe return through the glass connector. If the irrigating fluid flows in readily but fails to return, a clot may be obstructing the catheter opening. Do not add additional fluid, but try to dislodge the clot by gently squeezing or "milking" the tubing just below the connector. If there is still no return flow, notify the nurse or doctor.
6. Record time and total amount of irrigation in intake column of I & O worksheet. Measure and record amount of return, if any, in the emesis basin. Subtract the total amount of irrigating fluid from the output total in the drainage bottle.

5–87. Irrigation of the Bladder and Retention Catheter—Closed or Intermittent Method

EQUIPMENT

Sterile Y-vent irrigation set from CMS
Flask of prescribed sterile solution, 1000 ml.
Sterile drainage bottle, 1-gallon size, graduated in ml., from CMS

Irrigating stand
Emesis basin
Drainage bottle holder or footstool
Rubber band
Safety pin

NOTE

The contents of the sterile Y-vent irrigation set may vary, depending upon the type of irrigating flask used. A commercially prepared IV-type flask is recommended and the procedure described for the closed irrigation is based on the use of this type of equipment.

As prepared in CMS, the sterile items in the set will include—
Glass drip regulator, 1*
Y-tube glass connector, 1*
Straight glass connectors, 2*
Lengths of latex tubing, 3*: one 4-foot length; one 2-foot length, with glass connector inserted midway its length; one 1½-foot length
Hoffman clamps, 2
2-hole bottle cap with two short pieces of glass tubing, 1

* Assembled as follows: One end of a 4-foot tubing attached to drip end of regulator, other end attached to one arm of Y-tube; one end of 2-foot length of latex tubing attached to other arm of Y-tube; one end of 1½-foot length of latex tubing attachel to stem end of Y-tube; glass connector attached to free end of 1½-foot tubing. This preassembly of tubing before sterilization is a safety factor since it reduces handling for use.

PROCEDURE (FOLEY CATHETER IN PLACE) (fig. 5–75)

1. Clamp off the Foley catheter.
2. Place equipment on a wheeled table or other suitable work area at the patient's bedside.
3. Prepare the irrigating flask, following instructions on label.

CAUTION

Check label as for medications.

4. Place one Hoffman clamp on the 4-foot length of tubing, below the drip regulator. Close the clamp. This length is the in-flow tube.
5. Place one Hoffman clamp on the 2-foot length of tubing, above the glass connector. Close the clamp. This length is the out-flow tube.
6. Insert the 2-hole stopper into the gallon bottle. Connect the free end of the out-flow tubing to one glass tubing in the stopper. The second glass tube is the air vent.
7. Insert the drip regulator into the irrigating flask. Invert the flask and suspend it at the prescribed height above the patient's bladder.
8. Release the clamp on the in-flow tube, allowing fluid to run through the tubing to remove air.

NOTE

The fluid will flow from the straight glass connector on the 1½-foot tubing; hold this connector over the emesis basin. Close the clamp.

9. Place the drainage bottle in the holder or on the footstool.

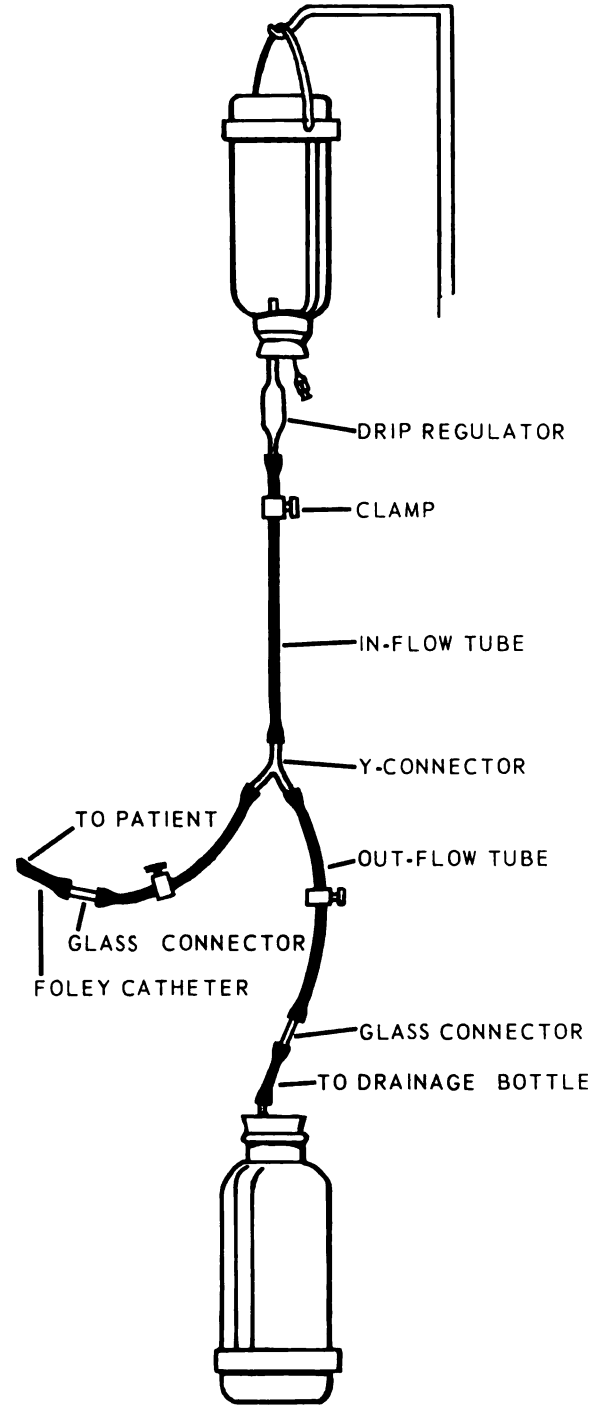


Figure 5–75. Closed bladder irrigation.

10. Attach the straight glass connector on the 1½-foot tubing to the patient's Foley catheter. Avoid any tension on the catheter.
11. Loop the elastic band around the Y-tube and pin it to the foundation sheet at bladder level.

CAUTION

Do not allow the Y-tube to dangle off the bed; when secured properly, the out-flow will be regulated so that some fluid remains in the bladder at all times. This precaution helps to prevent blood, mucus, or other solid matter from clogging the catheter opening.

12. Open the clamp on the out-flow tube. Open the clamp on the Foley catheter. Allow urine to flow into the drainage bottle before irrigating the bladder. Note color and any sediment, clots, or mucus shreds.
13. To irrigate the bladder:
    a. Clamp off the out-flow tube.
    b. Release the clamp on the in-flow tube.
    c. Allow the prescribed amount of irrigating fluid to flow slowly into the bladder, usually 50 to 100 ml. at one time. Observe fluid calibrations on the flask.
    d. Clamp off the in-flow tube. Unless otherwise ordered, allow irrigating fluid to remain in the bladder about 1 minute.
    e. Open out-flow tube to drain solution. Observe color and character of return in glass connectors.
    f. Repeat these steps (a through e above) p.r.n. until total amount of irrigation solution, in prescribed increments, has been used.
14. Follow specific orders for keeping out-flow tube open or closed following irrigation. Some patients must have constant open catheter drainage, and others must have the catheter clamped and reopened on a definite schedule.
15. Record total irrigation fluid on I & O worksheet.
16. Empty drainage bottle before it is two-thirds full, or as ordered. Record total on I & O worksheet.
17. Change irrigating tubing as ordered—this may be daily or when the catheter is changed.
18. Handle all connections so as to prevent contamination.
19. Keep additional unopened sterile irrigating flasks available for replacement p.r.n.
20. Keep the flask in use at the prescribed elevation.
21. Follow doctor's instructions in regard to teaching and supervising the patient when he is to perform any part of the closed irrigation procedure. (With assistance, the patient may be permitted to carry out step 13.)

Section IX. ADAPTATIONS OF BASIC NURSING CARE—MEDICAL-SURGICAL PROCEDURE

5-88. Caring for the Incontinent Patient

Incontinence is involuntary urinating or defecating. It may be a temporary problem during a period of acute illness when an adult patient is less aware of the sensation of needing to void or to defecate and is too ill to ask for a bedpan or urinal; it may be a continuing disability due to spinal cord injury or disease; or it may be associated with general debility and other problems that may occur with old age. Whatever the cause, there is loss of sphincter control. With urinary incontinence, there is loss of control of the urethral sphincters; with fecal incontinence, loss of control of the anal sphincter. It is a nursing responsibility to provide prompt attention when incontinence occurs. It is essential to establish a routine method for protecting the patient to keep him as clean, dry, and free of embarrassment and anxiety as possible and to prevent bed sores which would otherise inevitably occur.

a. Nursing Measures for Urinary Incontinence.

(1) Place the patient on a bedpan or provide a urinal at frequent and regular intervals. Try to anticipate when voiding may occur. *For example,* half an hour after fluid intake or meal time may be the optimum interval for getting to the patient on time.

(2) Protect the bed with moisture-proof draw sheets and also with large disposable pads (protective pads with absorbent-cellulose inner padding and plastic backing) which can be changed readily when wet or soiled.

(3) Wash entire buttocks, perineum, and thighs with mild soap and warm water each time incontinence occurs. Urine must be completely washed off and not allowed to dry on the skin. Pat the skin dry.

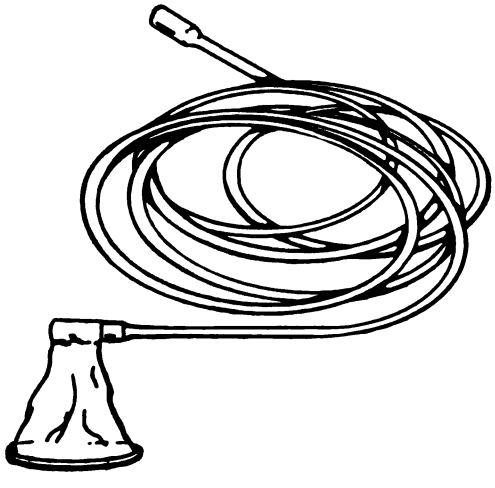
(4) Change bedding as well as protective pads when wet or soiled. Do not use deodorizers as a substitute for cleanliness. If the mattress is soiled, move the patient to an adequately protected clean mattress and exchange the soiled mattress through local supply procedure.

(5) With permission of the doctor, use an external drainage device such as a penile sheath for male patients. Satisfactory methods for keeping female patients dry are difficult to devise other than to use extra large perineal pads and change them frequently. Use of an indwelling catheter may be the only practical way to keep the patient dry; this always requires a medical order.

b. Male External Urinary Attachment (Penile Sheath). This practical method of caring for incontinent male patients has been used by AMEDD personnel in field and fixed hospitals and is often referred to as a "gizmo." The patient is fitted with a condom whose tip is attached to a drainage tube leading to a collecting bottle. The device protects the skin from exposure to urine, facilitates exact determination of urinary output, and prevents soiling of bedding. The following steps are used:

(1) Pull the closed end of a condom securely over one end of a large diameter glass or clear plastic connecting tube and tie, using suture cotton or other thread. If a disposable plastic collecting bag and drainage tubing is used, attach the condom to the connected adapter end of the tubing, as illustrated below.

(2) Perforate the closed end for urine drainage.



(3) Roll the condom onto the clean, dry penis. Leave about one-half inch of the sheath free between the meatus and the connecting tube. Be sure there is no excessive free length, as it will twist and interfere with drainage.

(4) Secure the sheath to the shaft of the penis with adhesive tape, applied so as not to constrict the penis but still prevent leakage of urine.

(5) Connect the glass tube, if used, to drainage tubing. Loop tubing to thigh with adhesive tape to avoid tension on the penis.

(6) Remove and change the sheath at least once daily. Cleanse skin and check the glands and shaft of the penis for any signs of irritation. Do not reapply if irritation is present.

NOTE

External catheters may be available commercially.

5-89. Nursing Care of the Unconscious Patient

a. General. Unconsciousness means that the patient is completely unaware of what is going on around him and is unable to make purposeful movements. The basic principle to remember is that the unconscious patient is totally dependent on others for all of his needs. Any omissions in basic nursing care or any failure to protect the unconscious patient in his helpless state may inhibit recovery or greatly prolong his convalescence because of complications which might have been prevented.

b. Causes of Prolonged Unconsciousness. The most common causes include cerebral vascular accident (CVA), commonly known as stroke; head injury due to trauma; brain tumor; or effect of overdosage of a sedative drug. However, the cause frequently is not apparent immediately. Regardless of the cause, basic nursing care measures are an essential part of treatment.

c. Levels of Consciousness. Because unconsciousness varies in duration and depth the medical specialist needs to understand terms used in classifying the patient's state of consciousness. Three terms frequently used are:

(1) *Somnolence.* This is unnatural drowsiness. The patient can be aroused by calling his name or by asking him to respond to a command such as sticking out his tongue. He can often answer questions, although he may be confused. He will fall asleep again as soon as he is left alone.

(2) *Semicoma.* This is partial unconsciousness or stupor. The patient can be aroused by painful stimuli such as pinching the skin of his

arm and may respond with a purposeful, protective, withdrawal movement. The stuporous patient may be very restless or combative and must be protected from self-injury.

(3) *Coma.* This is complete unconsciousness, with no purposeful response to sensory stimuli such as pain, pressure, light, sound, or temperature.

d. Nursing Measures and Precautions.

(1) Never give an unconscious patient anything by mouth. A patient who is unconscious for a prolonged period is usually fed food and fluids by gavage.

(2) Maintain an unobstructed airway by proper positioning. Whenever possible, turn the patient on his side and extend his chin to eliminate the danger of the relaxed tongue falling back and closing the airway. This side-lying position is often referred to as the coma position. It is considered to be the only safe position in which to place the patient when an attendant must leave the bedside.

(3) Use pharyngeal suctioning p.r.n. to prevent aspiration of regurgitated tube feeding, mucus, or vomitus. Exercise great care to prevent injury to mucous membranes.

(4) Change the position to a new weight-bearing surface q. 2 h. Be particularly careful about supporting and positioning the limbs in good alinement during the turning procedure, as well as in repositioning. Never allow the arms to be caught and crushed under the weight of the body. Never allow flaccid arms or legs to dangle or drop over the edge of the bed.

(5) Protect the patient from injury. Use bedrails in the up position on both sides of the bed. Pad the rails with pillows, or folded blankets if the patient is restless. Use restraints only on order and only with full precautions to prevent constriction of circulation and damage to the skin (para 5-31). The restless, confused patient will actively resist restraint and thrash about more when he is not permitted some freedom of movement of his arms and legs. Recommended measures to encourage rest and to protect catheters and dressings are the use of mittens or a folded sheet restraint over the knees or chest; if applied over the chest, the restraint must not restrict breathing. Posey's restraints, belts, and vests are very effective with these types of patients.

(6) Give special skin care to prevent pressure sores. If the patient is incontinent, he should be thoroughly washed and dried, and his bed linen changed immediately if wet.

(7) Provide special oral hygiene measures at least q. 2 h. Include the tongue, as well as all tooth surfaces, tooth margins and hard-to-reach, soft tissue areas. The unconscious patient often is a mouth breather, and saliva will dry and adhere to all mouth and tooth surfaces. Always ~~have a~~ suction apparatus immediately available when giving mouth care to the unconscious patient.

(8) Check the eyes frequently for signs of irritation or infection. Neglect can result in permanent damage to the cornea since the normal blink reflex and tear-washing mechanism may be affected. Use only cleansing solutions and eye drops ordered by the doctor. One such solution, methyl cellulose, referred to as "artificial tears," may be ordered for instillation at frequent intervals.

(9) Cleanse and lubricate the vestibule of the nostrils to prevent drying and crusting. Surgical lubricant, a water-soluble compound, may be used; this avoids the danger of aspiration of any oily preparation.

(10) Observe and report on the state of consciousness. Note any changes in response to stimuli and in return of protective reflexes such as blinking the eyelids and swallowing saliva.

(11) Always take a rectal temperature. Hold the thermometer in place.

(12) Report at once any change in vital signs. Sudden changes are danger signals; *for example,* a sudden increase or decrease in blood pressure.

(13) Keep an accurate intake and output record.

(14) Watch for fecal impaction. The patient may be incontinent of stool, yet never completely evacuate the rectum. Small, frequent, loose stools may be the first signs of an impaction as the irritated bowel forces liquid stools around the retained feces. If enemas are ordered, use proper technique to insure effective administration and effective return of feces and solution.

(15) Learn what exercises are to be given to prevent joint contractures. Passive exercises, to include full range of motion (ROM), are usually given under the direction of the physical therapist. Know what followup exercises should be given by nursing personnel.

(16) Keep the room at a comfortable temperature for the patient. Check the warmth or cold-

ness of the extremities. Never apply heat without a doctor's order. Use soft, lightweight covering, and place the patient between cotton blankets if extra warmth is needed.

(17) Always assume that the patient can hear, even though he can make no response. Tell the patient what you are going to do, addressing him by name. Refrain from any conversation about his condition in his presence or in the room.

5-90. Care of the Dying Patient

a. General. The nursing care of the dying patient is essentially supportive care for physical and mental comfort. All medical orders are carried out, and nursing care is planned as for any seriously ill patient. These plans include consideration of the patient's family, who may be present day or night. The dignified and compassionate way in which all of the patient's needs are anticipated and met helps his family understand that he is receiving the best care possible. If a member of the family wishes to assist in giving nursing care, this can be planned for, if it contributes to patient and family comfort. It is important to remember that the medical officer informs the family of the patient's condition; nursing personnel must consult the doctor in regard to what information may be given to them and to the patient. Nursing personnel should take an interest in the welfare of the family members undergoing this ordeal and encourage them to get rest, regular meals, and sleep.

b. Signs of Approaching Death. Death may come suddenly or after many hours of a gradual slowing down of the life processes. Nursing personnel need to be aware of signs commonly associated with approaching death and need to recognize how these physiologic changes modify nursing needs. In general, the signs listed are related to failing circulation, loss of muscle tone, and loss of reflexes.

(1) *Failing circulation.* Body temperature may be elevated or subnormal. Skin may feel cold and moist, with progressive coldness of the feet and hands. The color of the skin may change, with cyanosis of the lips and nailbeds, and pallor or mottling (blotching) of weight-bearing surfaces of the buttocks and thighs.

(2) *Loss of muscle tone and reflexes.* Difficulty in swallowing, breathing, and ability to clear mucus from the throat may be very noticeable. As the jaw muscles sag, mouth breathing increases. Incontinence of urine and feces is common as sphincter control is lost.

c. Special Nursing Needs.

(1) Environment. If in an open ward, the patient is usually moved to a single room in consideration of his needs and the needs of other patients. If he is conscious, this move to "the quiet room" can be very alarming. To help soothe his alarm, keep his room light, cheerful, well ventilated, and clear of excess equipment. Speak in a natural tone of voice and continue to tell him everything to be done, even though he may appear to be unconscious. The sense of hearing is thought to be present until the end of life, so be alert to comments made within his hearing.

(2) Anticipate his need for privacy. Leave the patient alone with his family or chaplain when appropriate, but stay within call so as to be available immediately in case of need.

(3) Meet all physical needs for hygiene and comfort.

(*a*) *Care for the mouth.* Keep the teeth, mouth, and lips clean and moist. Suction mucus which has accumulated in his throat.

(*b*) *Continue oral intake, if patient is conscious.* Give small amounts of fluid at least every 1 or 2 hours as long as he is able to swallow. Moistening the lips and tongue with ice chips wrapped in gauze will refresh the patient who cannot manage sips of water.

(*c*) *Care for the eyes.* The blink reflex and tear ducts may not function. Protective eye drops may be ordered to keep the eyes moist ("artificial tears" eye drops). Instill these drops and wipe the eyelid margins gently with moistened cotton.

(*d*) *Continue position changes.* Provide support of head and shoulders to ease his breathing. Wash and rub his back with each position change. Use pillow supports for comfort and alinement. Arrange the bed covering to provide warmth, but do not constrict movement.

(*e*) *Provide for incontinence.* Use absorbent, disposable, plastic-backed protective pads, changing them as soon as wet or soiled. Wash soiled skin areas immediately with soap and warm water. Continue to offer the bedpan and urinal to the conscious patient at frequent intervals. (An indwelling catheter may be ordered if the patient is unable to empty his bladder and voids almost continuously in small amounts.)

5-91. Care of the Dead

The procedure for care of the dead must be in accordance with local policy which, in turn, must conform to county and State laws. In general, nursing responsibilities include three equally important duties: immediate notification of officials within the hospital; consideration for all of the patients on the ward; and preparation of the body of the deceased for transfer to the hospital morgue. Tact and sympathy for the patient's family, when present, must be shown.

a. At Time of Apparent Death. The specialist notifies the ward nurse or medical officer immediately if the patient has apparently ceased breathing. He does not touch the body until the medical officer has made his examination and pronounced the patient dead. The specialist notes the time when absence of pulse and respiration were observed and when the medical officer was notified. He also screens the patient from the view of other patients if this has not been done previously.

b. On Pronouncement of Death. Certain procedures are followed, in accordance with the details outlined in the local policy manual, after the patient is pronounced dead by the medical officer. In most instances, nursing personnel are responsible for—

(1) Notifying (by telephone) the registrar, chaplain, nursing office, and laboratory section in charge of the morgue.

(2) Assisting the administrative officer of the day (AOD), representing the registrar, in the inventory of all possessions of the patient. Nursing personnel may assist with the inventory and witness the property slip. The AOD takes charge of all possessions.

(3) Obtaining the ward "death pack," a preassembled unit containing a wrapping sheet, absorbent cotton and other padding, bandage rolls, safety pins, etc. Three identification tags (DA Form 8-219 (Death Tag)) are usually included with this pack. These tags must be signed by the medical officer before they are attached to the body.

(4) Delaying preparation of the body for the morgue until it has been determined whether or not relatives wish to see it. The medical officer, the nurse, or the chaplain, depending upon the situation, contacts the next of kin. The specialist finds out exactly what steps are to be followed if delay in preparing the body is indicated. The steps listed in the procedure below are a guide for the care of the body after death.

INITIAL CARE

Until permission for final ward care is received, the following steps may be allowable:

1. Lower the head rest, leaving one pillow.
2. Place the body in a natural position, with arms at the side, palms turned toward the thighs. Straighten top bed covers.
3. Close the eyelids gently.
4. Replace clean dentures p.r.n. Close the mouth gently.
5. Remove all treatment equipment from the patient unit such as IV stand, oxygen, or suction equipment.

FINAL CARE

Two individuals, one a senior, experienced person, should be assigned to carry out these final nursing care duties. If the deceased patient was female, female personnel care for the body.

Equipment

To equipment required for a bed bath (para 5-26) add:

The preassembled nursing service "death pack"
Stretcher
Sheets, 2
Litter straps, 2
Laundry hamper
Large paper bag
Sign for room door, "DO NOT ENTER"

Procedure

1. Follow steps for initial care 1 through 5 above if not done previously.
2. Remove all top bedding except for a drape sheet.
3. Remove pajamas.
4. Remove any dressings, drainage tubing, or catheters. Clean old adhesive markings from skin. If wounds are draining, place minimal clean gauze pads fastened with minimal amount of adhesive tape on wounds.
5. Bathe body gently.
6. Press gently on bladder to expel accumulated urine. Form large pad of cotton and ABD pads and place over rectum and genitalia to absorb feces and urine which will be expelled as sphincters relax. Hold pad in place with bandage T-binder.

NOTE

The pathology section of the local hospital will specify whether perineal body

openings are to be packed with cotton in addition to external padding.

7. Prop sagging jaw with folded ABD pads.

CAUTION

Bandage ties may mar the face and, if used, must be padded well with absorbent cotton.

8. Pad ankles with cotton and tie together with bandage.
9. Tie one signed tag (DA Form 8–219) to right great toe. Tie second signed tag to left wrist.
10. Roll body gently to side of the bed. While assistant supports it, place one clean sheet diagonally under the body.
11. Roll body back to center of the sheet.
12. Fold upper corner of sheet loosely over the head and face with lower corner over the feet. Secure the arms at the side as the right and left corners of the sheet are brought over to complete the wrapping. Fasten sheet with safety pins.
13. Fasten third signed tag to outside of sheet. If dentures could not be replaced, wrap in gauze, identify, and pin dentures next to tag.
14. Lift wrapped body to stretcher, using the bottom sheet on the bed for lifting. Fasten litter straps at chest and just above the knees, avoiding any pressure. Cover body with sheet.
15. Before moving body from preparation room, obtain clinical records which are to accompany body to the morgue; notify morgue attendant by telephone; if elevator is to be used, signal for it and hold it at the required floor; close patient doors if necessary; and verify appropriate route to be used to avoid, if possible, public entrances and lobbies.
16. Transport the body quietly and with dignity to the morgue. Remain with the body until the laboratory attendant has received it and transferred it from the ward stretcher. Turn over records to the morgue attendant.
17. Return to the ward with the stretcher. Do terminal cleaning procedure of the patient's unit.

Section X. SPECIALIZED NURSING CARE AND RELATED PROCEDURE

5–92. Care of Patients With Communicable Diseases

Communicable diseases are those which may be transmitted directly or indirectly from one person or animal to another. Direct transmission is by actual contact with the infected person or animal; indirect transmission is by contact with contaminated objects. Communicable disease microorganisms enter and leave the body through recognized portals of entry and exit; *for example,* the respiratory tract, gastrointestinal tract, and lesions of skin or mucous membrane. For additional discussion of causes and control of communicable disease, refer to FM 21–10.

a. Portals of Entry and Exit.

(1) *The respiratory tract.* The most common portal of entry and exit of microorganisms is the respiratory tract. Microorganisms leave the body of the infected person by means of droplets and by nose and throat secretions. Droplets, moist particles containing any pathogens present in the respiratory passages, are exhaled as a spray in coughing and sneezing and, to a lesser extent, in talking or just breathing. The droplet spray travels about 3 feet (more in a violent sneeze) from the source. Small residues (droplet nuclei) which result from evaporation of droplets remain suspended in the air of poorly ventilated enclosed spaces for relatively long periods of time and can be inhaled by a well person, who may then become infected with the disease. The infection may also be spread to a well person who improperly handles secretions of the patient's nose and throat or who inhales dust heavily contaminated with organisms.

(2) *The gastrointestinal tract.* Pathogenic organisms causing communicable diseases such as typhoid and dysentery are transmitted by the ingestion of food and water contaminated by feces. Such diseases result chiefly from poor hygiene and poor sanitation. The most common means of transmission can be summarized as the 5 F's: FECES, FINGERS, FLIES, FOOD, and FLUIDS.

(3) *Mucous membrane and skin.* Communicable disease organisms can leave the body of the infected person through exudates and secretions from infectious lesions and enter the body of the well person through cuts or small breaks in the mucous membrane and skin. *For example,* venereal disease (such as syphilis and gonorrhea), wound infections, and skin infections (such as impetigo) are spread in this manner. Direct contact

is usually the method of transmission in venereal disease; indirect contact, in wound and skin infections.

(4) *Inoculation into the blood stream.* Insects or animals that bite infected persons can transmit pathogens that cause such diseases as malaria, tetanus, and rabies to well persons that they also bite. Disease organisms can also be transmitted from one person to another by contaminated needles and syringes—a major mode of transmitting a disease such as serum hepatitis. Furthermore, blood from a wound of an infected person can transmit disease organisms by coming into contact with open cuts or wounds on a well person.

b. Community Measures for Controlling Communicable Diseases.

(1) *Community sanitation.* The control of communicable diseases may require local, state, national, or international regulations. These regulations frequently involve the departments of preventive medicine and the public health service. One of the most important aspects of control of infectious diseases is the provision of a sanitary environment. This includes insect and rodent control; inspection of food, milk, and water; and garbage and sewage disposal. Other measures include immunization programs, premarital examinations to detect venereal diseases, and community surveys to detect pulmonary tuberculosis.

(2) *Education of the public.* Although reporting communicable diseases is the responsibility of the doctor, it is the responsibility of everyone to report to the doctor or the proper public health official anyone—particularly himself—he has reason to believe is suffering from an untreated communicable condition. It is also the responsibility of everyone to inform himself of the methods of transmission of communicable disease organisms so that he can take measures to protect himself and others from infection. Good personal hygiene, including body cleanliness, adequate rest, and a well-rounded diet, will go far to strengthen the body's defense against disease. Avoiding crowded areas during periods of epidemics will also help. Furthermore, to aid in preventing spread of communicable disease, each individual must cover his mouth and nose when coughing or sneezing, carefully dispose of all tissues containing nose and throat excretions, and always wash his hands after using the toilet.

c. Hospital Measures for Controlling the Spread of Communicable Diseases.

(1) *Medical asepsis.* Recent hospital experiences with the spread of staphylococcal infections within the hospital environment have resulted in renewed emphasis on the importance of applying basic principles of medical asepsis in all hospital areas for all patients. Essential measures previously discussed include handwashing between contacts with patients; disinfecting equipment and utensils in common use before storing or using for another person; handling and disposing of all wastes, soiled linen, etc., to prevent the

Table 5-5. Differentiation Between Medical and Surgical Aseptic Techniques

	Medical Aseptic Technique	Surgical Aseptic Technique
Definition	All of the procedures used to protect the patient and his environment from the spread of infectious organisms.	All of the procedures used to sterilize and to keep sterile any object or article that is to be introduced into a wound or body cavity or that is to penetrate the skin.
Emphasis	On cleanliness (freedom from pathogenic organisms).	On sterility (freedom from all organisms).
Purpose	To reduce the transmission of pathogenic organisms from one person to another.	To prevent introduction of any organism into an open wound or body cavity.
Isolation	Patient with a communicable disease is separated from rest of patients by room, ward, or unit.	Patient requiring surgery is taken to the OR, a separate department away from the rest of the hospital.
Zone	A zone about the isolation unit is established as contaminated. *NOTE.* Everything within the zone of isolation is contaminated. Nothing goes out of the zone without being disinfected or wrapped in a clean cover to permit handling in a clean zone.	A zone about the site of operation or wound is established as a sterile field. *NOTE.* Once a sterile article touches an unsterile article, it is contaminated (unsterile). Only sterile articles are brought into the sterile field.
Handwashing	Hands and forearms are washed for 1 to 2 minutes to remove surface contaminants and soil. Plenty of soap, water, and friction are used, rubbing well between fingers and around nails. Hands are held down under running water to drain off fingertips. Hands and arms are dried with paper towels.	Hands and forearms are scrubbed for 10 minutes to reduce the bacterial count on the skin surface. Plenty of soap, water, and friction are used, rubbing well between fingers and under nails. Hands are held up under running water to drain off elbows. Hands and arms are dried with a sterile towel.
Gowns	Clean gowns are worn to protect the worker. Inside of gown is clean; outside of gown in contact with patient and his environment is contaminated.	Sterile gowns are worn to protect the sterile field from the worker. Outside of gown in contact with sterile field must be kept sterile.

spread of pathogenic organisms; maintaining adequate space (a distance of 5 feet) between beds; and keeping wards clean, dustfree, and well ventilated. When these measures are applied consistently, there is a large measure of built-in protection against the spread of communicable disease from an undiagnosed or unrecognized source.

(2) *Surgical asepsis.* Patients being treated in both surgical and medical wards require the use of surgical aseptic techniques to supplement the basic protective measures used in medical asepsis. Confusion sometimes results from erroneously thinking that medical and surgical asepsis measures require different emphasis when applied on a medical ward from those when applied on a surgical ward. What is required is an understanding of what is meant by "medical aseptic technique" and "surgical aseptic technique." A differentiation between some major considerations is outlined in table 5–5.

d. Nursing Care of Communicable Disease. Preparation for the provision of good nursing care includes knowledge of the duration and stages of the disease, techniques of isolation appropriate to the case, concurrent and terminal disinfection measures, comfort measures for the patient, diagnostic tests and specimens required, therapeutic measures usually ordered, observation for special signs and symptoms, and complications which may occur. For a brief description of some selected communicable diseases, along with pertinent points in nursing care, see table 5–6. (For additional information, refer to Control of Communicable Diseases in Man, 10th Edition, 1965, an official report of the American Public Health Association. This publication is available in every AMEDD medical library.)

5–93. Isolation Techniques

Isolation technique is a method of carrying out medical asepsis while caring for a patient with a communicable disease. It consists of: (1) setting up an isolation unit, (2) confining the patient to the unit, (3) using handwashing and protective clothing for individuals who care for or visit the patient, and (4) decontaminating (disinfecting) or destroying materials and utensils coming in contact with the patient. The medical officer determines the necessity for isolating the patient, writes the order, and explains the necessity of this treatment measure to the patient. In general, nursing personnel then have the responsibility of setting up and carrying out an approved form of isolation technique. Isolation technique practices vary from one AMEDD hospital to another—usually because of facilities available, particularly on availability of facilities for handwashing with running water and separate toilet and bath facilities for the patient on isolation. Local hospital procedures must be strictly followed. The procedures discussed in this section are typical of those used for isolation of a patient on a noncommunicable disease ward.

SETTING UP THE ISOLATION UNIT

a. *Location.* Use a single room, preferably with private toilet facilities. If such a room is not available, select a corner area of a multiple-bed room or ward in order to reduce proximity to other patients, and define the isolation unit by using cubicle curtains and portable screens to set it off from adjacent common-use areas.

b. *Designation of Contaminated and Clean Zones.*

- *Contaminated zones.* These include the interior of the patient's unit area and all of its contents; all floors; designated areas in the utility room to which contaminated materials may be brought for cleansing purposes; and interior of all sinks, hoppers, commodes, waste containers, and soiled linen hampers.
- *Clean zones.* These include offices, linen rooms, supply closets, nonisolated patient units; and treatment rooms. Everyone must be aware of these clean zones and be careful not to contaminate them by bringing into them any article from a contaminated zone that has not been disinfected.

Equipment

For Use Within Unit:
- Usual bedside equipment
- Thermometer, individual setup[1]
- Laundry bag
- Step-on can
- Plastic or paper bags

For Use At Entrance To Unit:
- Portable screens (if in multibed ward)
- Sign, "Isolation"
- Small table (or bedside cabinet)
- Basin stand, double[2]
- Washbasins, 2[2]
- Germicide solution[2]
- Paper towels
- Hand lotion
- Masks, disposable
- Gowns, clean
- Step-on can

NOTE

Specific drug therapy (the use of a drug that is particularly effective in destroying a particular organism) for an increasing number of communicable diseases usually reduces the period of communicability, the severity of symptoms and possible complications, and the requirements for intensive nursing care in many of these diseases.

Table 5-6. Nursing Care—Selected Communicable Diseases

Disease and causative organism	Source of infection, mode of transmission	Incubation period, communicable period	Common symptoms, possible complications	Points in nursing care
CHICKEN POX: (Varicella): Caused by virus.	*Source:* Secretions of skin lesions, nose and throat of infected persons. *Spread:* By direct contact with discharges from lesions, nose, and throat of infected persons. Indirectly by articles freshly soiled with such discharges.	*Incubation:* 2-3 weeks. *Communicable:* from 1 day before until 6 days after the appearance of first crop of vesicles. *NOTE.* Chicken pox is one of the most readily communicable of diseases.	*Symptoms:* Mild chill and fever. Pain in back and legs. Maculopapular rash appears in 24 hours, followed by vesicular rash lasting 3-4 days. Rash first appears on trunk and covered portions of body. Different stages of rash may be on same region of body at same time, occurring in successive crops. Lesions may appear on scalp and mucous membranes. *Complications:* Secondary skin infection, pneumonia, conjunctivitis.	Isolate in separate room. Complete bed rest until 24 hours after temperature returns to normal. Caution patient against scratching lesions. Pat, rather than rub, skin dry when bathing patient. Use care in combing his hair. Avoid loosening scabs. Lotions, if ordered, may be applied to skin for relief of itching. Force fluids. Diet as desired. *NOTE.* Special care is needed when lesions are on mucous membrances of mouth, throat, or genitalia. *Disinfection:* All articles in contact with discharges. Incinerate paper handkerchiefs and dressings soiled with discharges. Terminal disinfection: Thorough cleaning of room; air for 24 hours.
COMMON COLD: Caused by one or more viruses.	*Source:* Secretions from nose and throat of infectious persons. *Spread:* By direct contact with infected person. By cough or sneeze of infected person. Indirectly by articles freshly soiled with nose and throat discharges.	*Incubation:* 12-72 hours. *Communicable:* During incubation and early stage of disease.	*Symptoms:* Sudden onset; slight fever, chilly sensations, coryza, general lassitude, vague aches and pains in back and limbs. *Complications:* Bronchitis, pneumonia, sinusitis, otitis media.	Isolation as can be accomplished by bed rest during the acute stage. Caution patient against nose blowing with both nostrils occluded. Apply cold cream or bland ointment to upper lip and about nares. Force fluids. Diet as desired. *Disinfection:* All articles in contact with discharges. Incinerate paper handkerchiefs soiled with discharges.
DENGUE: (Breakbone Fever): Viruses of dengue fever.	*Source:* Blood of infected persons one day before and up to 5 days after onset. *Spread:* By bite of mosquito (Aedes Aegyptae) infected by biting a patient during the above period. The mosquito becomes infectious after an interval of 8-11 days, and remains so.	*Incubation:* 3-15 days. *Communicable:* From day before onset until the fifth day of disease.	*Symptoms:* Sudden onset; high fever, intense headache, joint and muscle pains, irregular eruption. Intense pain in eyes may be a complaint. *Complications:* Rare; prolonged feeling of fatigue and depression may be present during convalescence.	Room with screened door and windows for 5 days. Bed rest during fever period. Ice cap to head. Cradle to keep top covers off painful joints. Calamine lotion to relieve itching. Protect eyes from direct or strong light. Cold compresses to eyes may be soothing. Urge patient to keep eyes closed as much as possible. *Disinfection:* As for general hospital patient.

DYSENTERY: A. Amebic (amebiasis): Caused by endamoeba histolytica.	*Source:* Feces of infected persons, especially carriers. *Spread:* Indirectly by foods, articles, water, flies, soiled hands, or infected food handlers.	*Incubation:* 3 days to several months, commonly 3–4 weeks. *Communicable:* During course of infection and until feces are negative for ameba.	*Symptoms:* Diarrhea and abdominal cramps. Fever; weight loss; general debility; diarrhea, often bloody or watery stools, foul odor to feces. May be alternate constipation and diarrhea. *Complications:* Liver abscess, hepatitis, lung abscess.	Isolate during acute stages. Room with screened door and windows. Complete bed rest during acute stage. Teach patient to wash hands after defecation and before handling food. Measure intake and output. Chart description of each stool. During acute stage, feed patient frequent small meals high in carbohydrates; after acute stage, diet should be high in protein. Avoid fruit juices, leafy vegetables, salads. When emetine hydrochloride is being administered, watch patient for symptoms of visual disturbance, increased pulse rate, fall in blood pressure, pallor or cyanosis. *Disinfection:* All articles in contact with discharges from alimentary tract. Disinfect feces before disposal if municipal sewerage is not available. *Terminal disinfection:* Thorough cleaning.
B. Bacillary (shigellosis): Caused by various species of shigella.	*Source:* Feces of infected persons and carriers. *Spread:* Indirectly by infected person or carrier, also contaminated flies.	*Incubation:* 1–7 days. *Communicable:* During disease and until feces are negative for organisms.	*Symptoms:* Mucus or bloody diarrhea, abdominal cramps, tenesmus, fever, prostration. In severe cases, marked dehydration, abdominal distention, coma. *Complications:* Arthritis, pneumonia.	Room with screened door and windows. Bed rest depends upon the severity of disease. In acute stage, prevent chilling; keep room warm and quiet. Because disease may be of long term duration and be debilitating, daily baths with special attention to bony prominences are important. Devices for comfort should be employed where useful. Special mouth care q3h; force fluids during acute stage, avoid milk. Give frequent small meals, gradually return to normal diet. *Disinfection:* Same as for amebic.
HEPATITIS: A. Infectious (IH): Caused by unknown agent; a filterable agent has been demonstrated in experimental infection of volunteers.	*Source:* Feces, urine, and blood from infected persons *Spread:* Intimate person-to-person contact by fecal-oral route with respiratory spread possible; transfusion of whole blood, injection of blood serum or plasma from infected persons; con-	*Incubation:* 15 to 50 days, commonly 25 days. *Communicable:* Unknown—possibly from several days before to usually not more than 7 days after onset.	*Symptoms:* Fever, anorexia, nausea, malaise, abdominal discomfort, jaundice, usually prolonged convalescence. *Complications:* Rarely acute necrosis of liver; case fatality under 1%.	Isolation during first week of illness, Bed rest during the acute stage; frequent small feedings high in carbohydrate during period of anorexia. Measure intake and output; urge fluids. Gradual restoration of activity and full hospital diet. *Disinfection:* Feces, nose and throat secretions, and all articles in con-

Table 5-6. Nursing Care—Selected Communicable Diseases—Continued

Disease and causative organism	Source of infection, mode of transmission	Incubation period, communicable period	Common symptoms, possible complications	Points in nursing care
HEPATITIS—Continued	taminated water, milk, food, including oysters and clams.			tact with these secretions; thorough heat sterilization of syringes, needles and other instruments. *Terminal disinfection:* Use disposable rectal and gastrointestinal tubes, syringes, needles, etc., whenever possible. Break and dispose of rectal thermometers instead of attempting terminal sterilization and reuse by another patient.
B. SERUM (SH): Caused by: (See A, above).	*Source:* Blood or blood products from an infected person. *Spread:* By parenteral inoculation of human blood or blood products or by use of syringes, needles, or other instruments contaminated with traces of such materials.	*Incubation:* 50 to 160 days, usually 80 to 100 days. *Communicable:* Unknown. Some blood donors are known to have been continuously or intermittently infective for years.	*Symptoms:* As in A, above. *Complications:* Higher fatality than in IH (A, above).	No isolation—not known to be communicable except by injection. Bed rest may be prolonged with very gradual restoration of activities; diet and I & O as in A, above. *Disinfection:* Steam under pressure, dry heat, or ethylene oxide gas sterilization of syringes, needles, and stylets for finger puncture. *NOTE.* Use disposable equipment when possible.
INFLUENZA: Caused by influenza virus.	*Source:* Probably discharges from mouth and nose of infected person or carrier. *Spread:* By direct contact with discharges and droplet infection from infected person or carrier, possibly airborne. Indirectly by articles freshly soiled by discharges.	*Incubation:* 24–72 hours. *Communicable:* Possibly from incubation until after fever subsides.	*Symptoms:* Chills, fever, malaise, generalized aches and pains; intense headache; cough, sputum scant and watery at first, increases in amount and becomes mucopurulent; mental depression; prostration out of proportion to symptoms. *Complications:* Bronchitis, acute sinusitis, otitis media, pneumonia.	Isolation in separate room or ward. Complete bed rest until 24 hours after temperature returns to normal. Tepid sponges to refresh patient. Ice cap to relieve headache. Warm gargles may relieve throat irritation. Steam inhalations may relieve cough. Maintain cheerful attitude toward patient; keep room light and pleasant. Force fluids, diet as desired. *Disinfection:* All articles in contact with nose and throat discharges. Incinerate paper handkerchiefs.
MALARIA: Caused by protozoan parasite (four types). Plasmodium vivax. Plasmodium faciparum. Phasmodium ovali Plasmodium malariae.	*Source:* The blood of infected person. *Spread:* By bite of infected mosquito (Anopheles).	*Incubation:* Varies with species of infecting organism and the number infected. *Communicable:* As long as sexual form or organism exists in blood in sufficient quantities to infect anopheles mosquito.	*Symptoms:* Shaking chills, periodic fever, headache, malaise, skin hot and flushed during chills and high fever. After chills, profuse diaphoresis, extreme thirst, delirium, spiking temperature, backache. *Complications:* Anemia, hemoglobinuria, frequent relapses.	Room with screened door and windows. If not available, place netting over bed. Bed rest during paroxysms of chills and fever. In cold stage, apply blankets, hot water bottles, urge hot drinks. As hot stage develops (immediately after cold stage) gradually remove heat. Tepid sponges and ice cap to head may help during this stage. Force cold fluids. Place small pillow under small of back to relieve ache. If delirous, apply sidebars to bed as

				safety measure. Sweating stage follows hot stage, temperature drops rapidly, profuse diaphoresis. Force fluids, change linen frequently, keep dry, avoid drafts to prevent chilling patient. Three stages may last 6–10 hours. Observe and record time, severity, and duration of each stage.
MEASLES: (Rubeola): Caused by a virus.	*Source:* Secretions from nose, throat, eyes. *Spread:* By direct contact with infected person; by droplet. Indirectly by articles freshly soiled with discharges from mouth, nose and eyes.	*Incubation:* 10 days from exposure to onset of fever; 13–15 days to appearance of rash. *Communicable:* From 4 days before until 5 days after appearance of rash.	*Symptoms:* Coryza, sneezing, cough, nausea, vomiting, chilliness, fever, small grayish white spots at gumline (Koplik spots.) Rash appears third or fourth day; starts about ears, face, trunk and extremities. Fever increases during eruption, subsides as rash fades. *Complications:* Bronchopneumonia, otitis media, laryngitis, encephalitis.	Isolate in light airy room during period of communicability. Avoid direct or glaring light; protect patient from drafts. Complete bed rest until temperature returns to normal. When bathing, use very little soap; pat rather than rub dry. Itching skin may be relieved by a 5-percent solution of sodium bicarbonate. Petrolatum may be applied about nares and lips. Offer mouth wash and gargles frequently. *Disinfection:* All articles in contact with discharges. Incinerate paper handkerchiefs and dressings soiled with discharge from nose, throat, eyes. *Terminal disinfection:* Thorough cleaning of room; air for 24 hours.
MENINGITIS, MENINGOCOCCAL: Cerebrospinal Fever.) Caused by cocci.	*Source:* Discharges from nose and throat of patient and carriers. *Spread:* By direct contact with patient or carriers and by droplet. Indirectly by articles freshly soiled with infectious discharges.	*Incubation:* 2–10 days. *Communicable:* Until nose and throat discharges are negative for meningococci.	*Symptoms:* Sudden onset; fever, intense headache, nausea, vomiting, petechial skin rash; neck becomes stiff; patient stuporous or lapses into coma. Patient may assume opisthotonos position (spine arched backward to an extreme degree). *Complication:* Pneumonia.	Isolate in quiet, slightly darkened room. Change patient's position frequently. Use small pillows and other devices for comfort. Patient is very sensitive to noise, light, and touch. Handle him gently. Give frequent back care to avoid pressure sores. Give oral hygiene before and after feeding. Apply ointment about lips. Protect eyes from bright lights. *Disinfection:* All articles soiled by nose and throat discharges. Incinerate paper handkerchiefs. *Terminal disinfection:* Thorough cleaning of room; air for 24 hours.
MUMPS: (Infectious Parotitis). Caused by virus of mumps.	*Source:* Saliva of infected person. *Spread:* By droplet and direct contact with infected person. Indirectly by articles	*Incubation:* 12–26 days. *Communicable:* From 2 days before glands swell until swelling subsides.	*Symptoms:* Chilliness, malaise, moderate fever, pain on swallowing and chewing. Swelling below and in front of ear. The surrounding tissues are edematous; the submaxillary	Isolation for period of communicability. Complete bed rest until after swelling has subsided. Heat or cold may be applied to affected area if desired. Special mouth care with

Table 5-6. Nursing Care—Selected Communicable Diseases—Continued

Disease and causative organism	Source of infection, mode of transmission	Incubation period, communicable period	Common symptoms, possible complications	Points in nursing care
MUMPS—Continued	freshly soiled with saliva of such person.		glands often swollen and tender. Features are distorted. Movements of jaw are restricted and painful. May affect one or both sides. *Complications:* Orchitis, oophoritis, pancreatitis, mastitis.	frequent mouth washes or gargles. Force fluids and semisolids. Avoid acid fruit juices. A scrotal bridge may be ordered for male patient. *Disinfection:* All articles in contact with nose and mouth discharges. Incinerate paper handkerchiefs.
PERTUSSIS: (Whooping Cough): Caused by pertussis bacillus.	*Source:* Discharges from throat of infected persons. *Spread:* By direct contact with infected persons, by droplet infection. Indirectly by articles freshly soiled with such discharges.	*Incubation:* 7–10 days. *Communicable:* From 7 days after exposure to 3 weeks after onset of typical paroxysms.	*Symptoms:* Chilliness, malaise, moderate fever, coryza, dry hacking cough. Cough gradually becomes severe until characteristic whoop is noted. The paroxysmal stage is marked by coughing at intervals of varying frequency. Repeated paroxysms of coughing, loss of breath, whooping, and vomiting leave the patient exhausted, perspiring, and apparently dazed. *Complications:* Bronchopneumonia, hernia, hemorrhage, prolapse of rectum, convulsions.	Isolation in a separate, well-ventilated room. Patient should be kept quiet. Tight abdominal binder may give some support during paroxysms. Serve bland nourishing foods, neither very hot nor very cold. If patient vomits soon after eating, feed again. *Disinfection:* All articles soiled with discharges from nose and throat. Incinerate paper handkerchiefs. *Terminal disinfection:* Thorough cleaning; air room for 24 hours.
PLAGUE: Caused by plague bacillus. Types: Pneumonic. Bubonic.	*Source:* Infected rodents and patients. *Spread:* Direct by droplet, nose, and throat discharges in pneumonic form. Bubonic transmitted from rodent to man by bite of flea.	*Incubation:* Bubonic 2–6 days. Pneumonic 3–4 days. *Communicable:* Pneumonic during active stage. Bubonic–not communicable from man to man.	*Symptoms:* Pneumonia forms: Bronchopneumonia develops rapidly, sputum bloodstreaked and watery. This form is usually fatal in short time. Bubonic forms: Sudden onset: headache, vomiting, prostration. Delirium, conjunctiva injected, facial expression of weariness characteristic. Tongue furred and swollen, subcutaneous hemorrhages giving rise to term "Black Death." Lymph glands become swollen, painful, and may suppurate, especially those of the neck, groin, and axilla. *Complications:* High mortality rate, secondary pneumonia, and pleurisy.	Isolation in room with screened windows. In pneumonic type: Worker wears close-fitting hood, goggles, coveralls, rubber gloves, Nursing care that of pneumonia. Bubonic type: Nursing care is that of typhoid fever. The patient is very ill and needs constant care. *Disinfection:* In pneumonic type, all sputum, tissues, contaminated with mouth and nose secretions must be burned. In bubonic type, burn all dressings and bandages. Both types: all contaminated equipment must be disinfected. Urine and feces of patients must also be disinfected. Area of original infection should be treated to destroy rats and fleas. *Terminal disinfection:* Thorough cleaning; air room 48 hours. Bodies of persons dying of plague should be handled with strict aseptic precautions.

PNEUMONIA: A. Acute lobar: Caused by pneumococci.	*Source:* Probably discharges from nose and mouth of infected persons and carriers. *Spread:* By direct contact with infected person and by droplets. Indirectly by articles freshly soiled by such discharges.	*Incubation:* Possibly 1-3 days. *Communicable:* Unknown, thought to be until organisms no longer present in discharges. Possibly by minute suspended particles containing infectious agent.	*Symptoms:* Abrupt onset with chill. Rapid rise in temperature to 104°-106° F., skin hot and dry; malaise and headache; pain in chest; patient lies on affected side. Flushed face, cyanosis about lips. Herpes on lips. Increased respirations and respiratory grunt. Cough with tenacious rusty sputum. Pulse full and bounding. Delirium may be present. *Complications:* Spread to another part of lung, pleurisy with effusion, empyema, pericarditis, endocarditis, meningitis.	Isolate patient in a separate, warm, well-ventilated room free from drafts. Encourage patient to rest and relax. Complete bed rest is basic treatment. Plan procedures so as to disturb patient as little as possible. Change position every 3-4 hours. Daily bath; occasional back rub with lanolin or cocoa butter for elderly patients may prevent dry itching skin. Special mouth care every 3 hours. Apply ointment to lips to keep them soft. Force fluids. Diet as desired. Administer oxygen as necessary. *Disinfection:* All articles soiled by nose and throat discharges. Incinerate paper handkerchiefs. *Terminal disinfection:* Thorough cleaning; air room for 24 hours.
B. Primary atypical: Caused by virus.	*Source:* Discharges from the nose and throat. *Spread:* By direct contact with infected person. Indirectly by articles freshly soiled by nose and throat discharges. Mild unrecognized infections may help spread of disease.	*Incubation:* Not definite, may be 7-21 days. *Communicable:* Unknown length of time.	*Symptoms:* Chilliness, fatigue, malaise, fever, range 99°-104° F. Intense headache. Painful and exhausting cough with scant sputum. *Complications:* Pericarditis, pleurisy, empyema, encephalitis.	Similar to points listed under A; bed rest for several days after temperature returns to normal.
POLIOYMELITIS: (Infantile Paralysis): Caused by virus of poliomyelitis.	*Source:* Discharge from nose, throat, intestinal tract of acutely ill and/or convalescent patient, carrier. *Spread:* By direct contact and droplets spread through close association with infected persons.	*Incubation:* Usually 7-14 days. May be 3-35 days. *Communicable:* Latter part of incubation period and first week of illness (not definite).	*Symptoms:* Three stages. First stage: Gastrointestinal upset, fever, headache, malaise. Second stage: Meningeal irritation, severe headache, pain and stiffness in back of neck and limbs, muscle spasm. Third stage: Severe involvement of nervous system, paralysis. Patient may progress to all three stages, or disease may be limited to first and/or second stage. Often paralysis is the first sign of the disease. *Complications:* Atelectasis and pneumonia in patient with respiratory paralysis. Renal calculi, atrophy of paralyzed muscles.	Isolation in separate ward or room. Complete bed rest on a firm bed. Place fracture board under mattress. Use a covered footboard separated from mattress by blocks to prevent pressure of bedding on toes and to provide firm base for soles of feet when patient is in prone position. Woolen or cotton blankets should be next to patient. Physical and mental rest is essential; avoid drafts and glaring lights. Hands should be warm when touching patient. Maintain body in good alinement. Baths are frequently omitted during acute stage. When bathing, use gentle sponging movements and dry by blotting rather than rubbing. Fluids during acute stage, diet as desired later. Hot

Table 5–6. Nursing Care—Selected Communicable Diseases—Continued

Disease and causative organism	Source of infection, mode of transmission	Incubation period, communicable period	Common symptoms, possible complications	Points in nursing care
POLIOMYELITIS—Continued				packs are ordered (usually) as soon as diagnosis is made. Watch for nasal voice, hoarseness, difficulty in swallowing, twitching of facial muscles characteristic of bulbar type. Should respiratory paralysis develop, patient may be placed in a respirator. *Disinfection:* All articles soiled by nose and throat discharges. Incinerate paper handkerchiefs. If municipal sewerage is not available, disinfect feces before disposal.
RUBELLA: (German measles): measles): Caused by a virus.	*Source:* Secretions from nose and throat. *Spread:* Droplet or direct contact with infected person; indirectly by articles freshly soiled with secretions.	*Incubation:* 14 to 21 days; usually 18 days. *Communicable:* For about one week before and at least 4 days after onset of rash. Highly communicable.	*Symptoms:* Mild fever, rash of variable character, sometimes resembling that of measles (Rubeola), scarlet fever, or both. Few or no constitutional symptoms; almost always enlargement of regional lymph nodes—particularly postauricular (behind the ears), suboccipital or postcervical (back of neck). *Complications:* None in the patient but causes significant proportion of congenital deformities in babies whose mothers have had the disease in first 4 months (first trimester) of pregnancy.	Isolation where contacts include a woman in early pregnancy. If isolated, for 5 days after onset. General nursing care for bed rest patient with mild, acute, febrile illness.
SCARLET FEVER: Caused by hemolytic streptococci.	*Source:* Discharge from nose and throat, abscesses, wounds of infected persons. Also carriers. *Spread:* Direct contact with patient or carrier. May be airborne. Articles freshly soiled by discharges in infected person or carrier; by contaminated milk and milk products.	*Incubation:* Usually 2–5 days. *Communicable:* Until few days past clinical recovery, all abnormal discharges stopped, open sores or wounds have healed.	*Symptoms:* Sudden onset, sore throat, vomiting, rapid rise in temperature. Tongue heavily coated, in few days becomes bright red, swollen, "stawberry tongue." Forehead and neck flushed, region around mouth is usually pale. Usually a fine rash, blanching on pressure; appears on neck, chest, axilla, elbow, groin, inner aspect of thigh. Pulse is rapid, appetite is poor; bowels constipated, urine scanty. Restlessness, headache, insomnia, delirium, and convulsions may occur during disease. *Complications:* Cervical adenitis, otitis media, nephritis, arthritis, rheumatic fever, endocarditis.	Isolation in separate room. Complete bed rest until 24 hours after temperature returns to normal. Tepid sponges may be given to reduce temperature. Addition of sodium bicarbonate to bath water may relieve itching. Olive oil or cocoa butter applied during desquamation (peeling of skin) period adds to patient's comfort. Never use alcohol during desquamation stage. Give mouth care q4h; throat irrigations or gargles may give relief during sore throat stage. Accurately measure intake and output of fluids and semisolids during acute stage. *Disinfection:* All articles soiled with discharges from nose, throat, sores,

				wounds. Incinerate paper handkerchiefs and dressings. *Terminal disinfection:* Thorough cleaning of room; air for 24 hours.
TUBERCULOSIS: (Pulmonary): Caused by tubercle bacilli.	*Source:* Person with "open" tuberculosis (sputum, nose and throat discharges contain tubercle bacilli). Milk from tubercular cattle. *Spread:* Direct or indirect contact with infectious persons, by means of coughing, sneezing, droplets. Infections rarely occur from casual contact but usually from long and close exposure.	*Incubation:* Variable. *Communicable:* As long as the tubercle bacilli are discharged by the patient.	*Symptoms:* Fatigue without cause, loss of weight, cough of 3 or more weeks duration which does not respond to treatment. Loss of appetite and digestive disturbances. Nightsweats. Afternoon temperature elevation. Tubercle bacilli may be found in sputum and/or gastric washings. Lesion may be found on chest X-ray. *Complications:* Spread, pleurisy with or without effusion, hemorrhage, atelectasis, spontaneous pneumothorax.	Isolation in separate room or special ward. Tuberculosis is a long-term disease; therfore, morale is an important factor. Rest is an essential of treatment. Teach patient ways to protect himself and others from infection. Plan nursing care in accordance with TB MED 231, Prevention of Spread of Tuberculosis in Armed Forces Hospitals, and TB MED 236, Management of Pulmonary Tuberculosis. *Disinfection:* All articles in contact with patient. Incinerate paper handkerchiefs and sputum cups.
TYPHOID FEVER: Caused by typhoid bacillus.	*Source:* Feces or urine of infected persons and carriers. *Spread:* Direct contact with patient or carrier, indirectly by contaminated water, food, milk, shellfish, flies.	*Incubation:* Variable; average 2 weeks, usual range 1–3 weeks. *Communicable:* From first symptoms throughout convalescence or until excreta is repeatedly negative for organism.	*Symptoms:* Variable, lasts 4–6 weeks. First week: Constant severe headache, irregular pulse, cough, bronchitis, constipation or diarrhea. Epistaxis (nose bleed), fever higher each p.m. until it reaches 104°–105°F. Second week: Fever remains high, heavily coated tongue, sores, rose spots on abdomen, pulse slow in proportion to temperature, dullness, lethargy, low muttering delirium, eyes open and staring. Third week: Gradual decline in temperature, beginning of convalescence. Convalescence is long, may be 2 weeks to several months. *Complications:* Intestinal hemorrhage may occur in second or third week. Perforation of intestine may occur late in disease. Phlebitis, bronchitis, pneumonia, cholecystitis.	Isolate in room with screened door and windows to exclude flies. Plan care to provide maximum rest for patient. During period of high fever, take rectal temperatures, give tepid sponges, ice cap to head, mouth care q2h. Watch bony prominences closely for pressure areas. Avoid pressure on abdomen when bathing patient. Stay with patient during delirium. Allow patient to chew gum if he is able. If constipation is present, enemas may be ordered; give very slowly. Cathartics are not given because of danger of perforating intestines. Diet—High caloric, high carbohydrate in frequent small meals. Force fluids. Patient may be fed because of lethargy and poor appetite. *Disinfection:* All articles in contact with patient. Disinfect excreta before disposal when municipal sewerage is not available. Incinerate all burnable materials.

Table 5-6. Nursing Care—Selected Communicable Diseases—Continued

Disease and causative organism	Source of infection, mode of transmission	Incubation period, communicable period	Common symptoms, possible complications	Points in nursing care
TYPHOID FEVER—Continued				*Terminal disinfection:* Thorough cleaning, airing, and sunning of room.
TYPHUS: FEVER: Caused by rickettsia prowazeki: A. Epidemic. B. Endemic.	*Source:* A. Epidemic type, infected persons. B. Endemic type, infected rats. *Spread:* A. Epidemic type, bite of infected louse, or feces of infected louse inoculated into bite or wound. B. Endemic type, bite of infected flea.	*Incubation:* 6–15 days. *Communicable:* Not from man to man. Patient is infective to lice during fever and possibly 2–3 days after temperature is normal.	*Symptoms:* High fever, chills, severe headache, severe back and generalized body aches and pains. Rash about fifth day covers trunk but avoids hands, feet, face. Cough, bronchitis. Pulse slower than fever would indicate. May become stuporous, delirious. *Complications:* Bronchitis, bronchopneumonia, otitis media, mastoiditis.	Place in room or ward after all lice and nits have been removed from his person. Patient and bedding should be dusted with DDT once a week during febrile period. Force fluids during period of high fever. Care is similar to that of typhoid fever. *Disinfection:* As for a general hospital patient. Handle linen carefully.

Plastic or paper bags
Laundry bag and conveyor
Tag—"Contaminated Linen" (color-coded)

For Use In Utility Room:
Newspapers
Toilet brush
Can or pitcher of prescribed germicide-detergent solution
Basin of prescribed germicide-detergent solution
Hand brush p.r.n.
Paper towels

[1] Refer to page 5-63 for individual thermometer set up.
[2] For handwashing when handwashing with running water is not available outside and immediately adjacent to the isolation unit.

Procedure

1. Assemble all equipment to be taken to the unit at the same time. Place all appropriate articles on a cart to avoid extra trips.
2. Screen off the entire unit if it is set up in a multiple-bed ward. Use cubicle curtains for side screens and portable screens at the foot of the bed, placing screen to allow adequate space for access to foot-of-bed area within the isolation unit.
3. Attach "Isolation" sign to outside of screen at cubicle or to door of room.
4. Inform all other patients that the isolation unit is off limits to them.
5. Place within unit, near the exit:
   a. Laundry bag, for soiled linen.
   b. Step-on can, lined with plastic or paper bag.
6. Arrange equipment for convenience and immediate accessibility outside entrance to unit:
   a. Cabinet (or table) for clean gowns, disposable masks, paper towels, a few extra paper or plastic bags, 2 extra laundry bags.
   b. Handwashing unit.
   c. Step-on can lined with plastic or paper bag —for towel and mask disposal.
   d. Laundry bag in conveyor (color-coded "Contaminated Linen" tag, tied to cord or flap of bag; 12-inch, fold-over cuff).
7. Arrange equipment for convenience and immediate accessibility in designated area of utility room:
   a. Counter or table area, with top surface protected with four layers of newspaper—for temporary placement of contaminated utensils.
   b. Basin of germicide-detergent solution—for immersion of contaminated articles p.r.n.
   c. Toilet brush in container (may use size 10 tin can) of detergent-germicide solution.

5-94. Handwashing and Hand Care

The greatest single factor in preventing the spread of disease is washing the hands before and after caring for a patient. Because of emphasis on the necessity for handwashing after contact with the patient and his contaminated articles, the need for washing hands before approaching the patient in isolation is sometimes neglected; the patient in isolation needs all possible protection to keep him from being exposed to new infection or reinfection.

PROCEDURE

1. Remove rings and wristwatch before entering the unit. Pin rings inside the uniform pocket and do not wear them when in patient care areas.

NOTE

If a wedding band is not removed, be sure to move it up and down while washing hands to cleanse skin under and around the metal. Place wristwatch on clean paper towel on the table outside the unit. When needed inside the unit, carry the watch in on the towel.

2. Follow recommended handwashing procedures (para 5-6), with these additions upon leaving the unit:
   a. *Running water technique.* Repeat lather and friction steps, for a total of 2 minutes washing.
   b. *Basin technique.* Change solution q. 2 h. unless a more frequent change is required because of heavy use.
   c. *Hand care.* Dry hands thoroughly and use hand lotion regularly to keep skin in good condition. Rub lotion into cuticles as well as skin surfaces to help prevent hangnails and chapped, irritated skin.

5-95. Mask Technique

a. General. Masks are worn to protect the worker from inhaling disease organisms spread by droplet spray and from dust present during bedmaking, linen handling, and unit cleaning procedures. Although there are differences of opinion on how effective the types of masks usually available are as a filter barrier, the use of a mask is recommended in the following instances:

(1) When in close contact (within 3 feet) of a patient expelling droplet spray. The patient may also be required to wear a mask—this is determined by the medical officer.

(2) When handling contaminated linen as in bedmaking or removing linen from the unit or when cleaning in the unit. Even careful damp-dusting and wet-mop floor cleaning measures stir up some contaminated dust. Mask and gown should be worn at these times.

b. Rules When Using a Mask.

(1) Put on mask, with clean hands, before entering the unit. When a gown is also worn, put on the mask first.

(2) Change the mask at least every hour when prolonged wear is necessary and change it at more frequent intervals if it becomes damp.

(3) Once the mask is removed from nose and mouth, discard it in the designated container. Do not wear it bib-fashion around the neck or put it in a pocket.

PROCEDURE

1. Wash hands.
2. With clean hands, remove a clean mask from its container.
3. Open mask by pulling on strings or elasticized side loops.
4. Fit the mask over the nose and mouth; slip loops over ears or tie strings at back of head and neck. Take time to fit the mask well because once it is on, it should not be readjusted.
5. When removing the mask, wash hands before touching the ear loops or strings (these are considered clean).
6. Handle discarded mask by loops or strings only; discard the mask by dropping it into lined, step-on can.

NOTE

When reusable masks must be used, line discard container with a mesh bag (laundry net) obtained from linen supply; this bag is then tied and dropped into the soiled linen bag. Clean, laundered masks are sent to CMS for rolling, autoclaving, and distribution to using activities in a suitable container (usually a canister, but it may be a paper bag). Reusable masks are sterilized by autoclave as a safety factor because of the multiple-handling procedures necessary in sorting and rolling for distribution.

7. Wash hands.

5-96. Gown Technique

a. Protective Gowns. Gowns are worn to protect the wearer's clothing. Gowns are worn by—

(1) Personnel giving contact care to the patient. This includes bathing, bedmaking, giving treatments, taking TPR and BP, giving parenteral medications.

(2) Personnel handling contaminated linen, damp-dusting, or otherwise cleaning the patient unit.

(3) Visitors when in contact with the patient or his immediate surroundings; *for example,* standing at the bedside or sitting in a chair within the unit.

b. General Precautions When Using Gowns.

(1) Supply enough gowns at the entrance to the unit so that a clean gown is available for each individual who enters the unit. On leaving the unit, remove and discard the gown into the laundry bag outside the unit. This "discard technique" is the simplest and the safest procedure. Other techniques—in which the gown is removed, hung up, and reused—are more apt to result in contamination of clothing and environment and are therefore not recommended.

(2) Check clean gowns before placement at point of use to insure that they have no holes, that ties and belt are intact, and that sleeves have knit cuffs. Send defective gowns for linen repair and place only clean, usable gowns in the gown supply at the entrance to the isolation unit.

PROCEDURE (DISCARD TECHNIQUE)

Putting On The Gown

1. Remove wristwatch.
2. Wash hands.
3. Put on mask, if indicated.
4. Take gown from cabinet or table.
5. Open gown full length, thrust hands through sleeves, and draw the neck of the garment into place. Tie the gown at the neckband in the back.
6. Grasp edges of the back of the gown and lap one edge over the other to completely cover clothing.
7. Fasten belt ends in a bowknot at the back snugly enough to hold gown folds in position to cover clothing (fig. 5-76).

Figure 5–76. Fastening clean gown.

8. Push sleeve cuffs above wrists to convenient working level.

Removing the Gown and Mask

1. Untie the belt and push sleeves up about 2 inches.
2. Wash hands without touching sleeve cuffs.
3. Untie neck strings of the gown.
4. Place fingers under the cuff and pull down the sleeve over the hand without touching the outside of the gown.
5. With hand inside sleeve, draw other sleeve down over hand.
6. Slip out of gown by working hands up to shoulder seams of gown.
7. Keeping hands inside under the shoulder seams, lift gown off shoulders. Roll gown away from you with the contaminated side inside (fig. 5–77).
8. Place gown in laundry bag.
9. Remove mask as described in paragraph 5–95 and place in contaminated container.
10. Wash hands.

Figure 5–77. Discarding used gown.

5–97. Glove Technique

If the use of gloves is indicated when handling highly infectious materials, use clean plastic disposable gloves when they are available. If gloves are indicated for wound care or other procedures requiring surgical aseptic techniques, use sterile gloves, following sterile gloving procedure. In either instance, discard heavily contaminated gloves —do not attempt to rinse, wash, or return them to CMS.

PROCEDURE (CLEAN)

1. Wash hands.
2. Dry hands thoroughly with paper towels.
3. Put on gloves at entrance to unit, covering cuffs of gown with glove cuffs to protect all skin surfaces.
4. Remove gloves before leaving the unit by pulling glove cuffs down and turning contaminated surfaces to the inside. Discard gloves in waste receptacle within the unit.

5–98. Caring for a Patient in an Isolation Unit

The care of the patient in an isolation unit is

essentially the same as for any patient, but with increased emphasis on the principles of medical asepsis. Some patients will be confined to bed and will be very limited in the amount of self-care permissible; other patients may be allowed up and around within the confines of their room or unit area but must still depend upon nursing personnel to attend to many of their needs—the patient in isolation is quite limited in his self-sufficiency. Some major considerations in carrying out medical asepsis for the patient in isolation include—

a. Allowing adequate time for proper use of handwashing, masking, and gowning facilities and all other protective measures.

b. Having the supplies and facilities for isolation technique available in the location where they are to be used and set up ready for use.

c. Handling articles removed from or taken into contaminated areas in accordance with a predetermined, unvarying routine.

d. In some instances, assigning a "clean assistant" who remains outside the isolation unit, but who is on call to assist the worker within the unit. *For example,* it is the clean assistant who should hold open a clean bag or other wrapper into which a contaminated article is dropped; it is the clean assistant who obtains supplies from a clean area for the worker in the unit, etc.

e. Using disposable articles to the greatest extent possible; *for example,* paper cups and plates, plastic eating utensils; paper and plastic protective pads instead of rubber sheets; disposable treatment sets and trays; disposable syringes, needles, catheters, etc.

ROUTINE PROCEDURE— ON ENTERING THE PATIENT'S UNIT

1. Assemble any equipment needed for the patient.
2. Check utility room to insure designated area is prepared for temporary placement of contaminated articles removed from isolation unit.
3. Check supplies at entrance to unit and replenish p.r.n.
4. Place equipment to be taken into unit at entrance to unit. Place articles which are to be kept clean while in use (such as a watch) on a paper towel.
5. With clean hands, put on gown and mask.
6. Pick up equipment, open door, and enter unit, making the number of trips that are necessary. Pull screen or door closed, touching only the inside of the screen on door.

NOTE

Hands are now contaminated.

7. On completion of tasks and before leaving the unit, pick up and assemble at the exit all articles to be removed. Collect waste for disposal; collect all soiled linen items and place them in the laundry bag within the unit. Never allow waste disposal or laundry bag to become more than two-thirds full; replace immediately with clean collection bags. Always secure closure of waste bags before removing.
8. Before leaving, check to see that everything possible has been done for the patient's comfort and convenience—check his position, the signal cord, water and tissue supply, ventilation, light, etc. Ask the patient if there is anything he wishes you to do while you are there to do it.

ROUTINE PROCEDURE— ON LEAVING UNIT

1. Remove gown. Wash hands. Then remove and dispose of contaminated linen and wastes.

NOTE

Your hands are contaminated once you touch anything that has been in the isolation area.

   a. Deposit laundry bag from inside of unit into laundry bag on conveyor, using care not to touch outside of open bag.
   b. Take all contaminated utensils and waste inclosed in bag to utility room. Place on newspaper-covered surface temporarily.
   c. Use a paper towel to lift lid of waste can. Deposit waste bag in can and replace cover.
   d. Pour bath water, vomitus, and other liquid wastes into hopper. Use care to avoid splashing. Rinse utensils with cold water, discarding rinse water in hopper. Use paper towel when handling faucet and flush-lever. Place rinsed utensils on newspaper-covered surface temporarily.
   e. Place bedpan or urinal in bedpan washer-sanitizer, using paper towel to press down flush handle and turn on steam valve. Do not leave contaminated articles in utility room for someone else to clean. Complete all cleaning as soon as possible after use of item.
   f. Wash hands when completed.

2. For additional steps in caring for utensils and other contaminated equipment and articles, see table 5–7.

Table 5–7. Ward Care of Contaminated Equipment

a. Item	Preliminary steps b. by ward personnel	Suggested cleanup or holding c. General instructions	d. Area on ward	e. Field expedients
Utensils from patient's unit (Bath basins, emesis basins, trays or similar items retained on ward).	Empty all contents into toilet or hopper and flush into sewerage system.	1. Use paper towel to turn on water faucet or flush valve. 2. Rinse with cold water, avoiding splashing. 3. Clean with brush using germicide detergent or hot soap and water. Use friction. Rinse well. 4. Empty cleaning and rinse solution into toilet or hopper. 5. Place cleansed utensils in boiling water sanitizer. Submerge completely. 6. Wash hands. 7. Boil utensils for 30 minutes. 8. Place sanitized utensils in common-use storage area. 9. Rinse brush in cold water and boil in utensil sanitizer. 10. Wash hands before touching sanitized items.	1. Utility room. 2. For patients with toilet and water supply in isolation unit, follow steps 1 through 4 in patient area. Take mechanically cleansed articles to utility room for sanitizing.	Refer to FM 12–10, for details on construction of field sanitation devices. 1. Pour excreta into deep-pit or bored-hole latrine. *NOTE:* Follow local policy for use of calcium chloride (lime) for pretreatment of excreta before disposal. 2. Pour bath water and other fluids containing soap with a soakage pit prepared with a grease trap. 3. Rinse with cold water. Discard water in soakage pit. 4. Scrub with brush and prescribed detergent. 5. Immerse reusable utensils in boiling water (immersion heater unit). Boil for 30 minutes. 6. Burn or bury disposable items.
Urinals, bedpans	Take covered utensil to utility room. Place directly into bedpan washer-sanitizer. Flush contents into sewerage system.	1. Use paper towel to activate flush value and steam valve. 2. Wash hands. 3. Steam for 3 minutes. 4. Remove from sanitizer. Inspect for residual stains. Scrub with brush and detergent p.r.n. Rinse. 5. Place sanitized utensils in common-use storage area.	Utility room.	
Solid wastes and refuse, all disposable articles.	Place in plastic or paper bag or wrap in newspaper before taking from unit.	Close bag to completely inclose contents. Drop bag into waste receptacle. Wash hands.	Patient unit or utility room, for collection for incineration.	Handle in the same manner in b, c, or d, as applicable.
Food trays, pitchers, water glasses, etc.	In patient unit, if toilet available, pour liquid wastes into toilet. Flush into sewerage. Otherwise, take tray to utility room.	1. Discard liquid wastes into hopper. Flush hopper. Use paper towel to turn on water faucet or flush valve. 2. Scrape all solid wastes onto paper serving dishes. Wrap and discard into waste receptacle. 3. Have "clean" assistant hold open large plastic bag or paper bag. Slide tray and nondisposable	Wrapped tray and nondisposable articles to food service for sanitizing in dishwasher.	1. May be same, depending on mess dishwashing facilities. Otherwise, dishes are scraped, washed with brush, immersed in boiling water, and boiled for 30 minutes in immersion heater setup of ward unit. 2. Discard food wastes (solid) for incineration. Discard liquids into soakage pit prepared with a grease trap.

Table 5-7. Ward Care of Contaminated Equipment—Continued

a. Item	Preliminary steps b. by ward personnel	c. General instructions	Suggested cleanup or holding d. Area on ward	e. Field expedients
Food trays, etc.—Continued		dishes into bag without touching outside of bag. Assistant closes bag and places wrapped tray in designated area for pickup by food service personnel.		
Linen and all washable clothing.	Place directly into laundry bag within isolation unit.	1. Handle linen with no shaking or flapping. 2. Roll linen as removed from bed. 3. Place laundry bag from unit in open bag outside unit. Use care not to touch outside surface of this bag. 4. With clean hands, at outside of unit, close laundry bag when no more than two-thirds full by slipping hands under folded-down cuff. Tie securely. 5. Check color-coded tag "contaminated laundry" attached to outside of bag. 6. Replace clean laundry bag stat, using care to fit into conveyor with 12-inch, turn-down cuff.	Take to laundry pickup point (outside of bag is clean).	Same—laundry point pickup service by quartermaster unit.
Treatment trays and reuseable items from CMS.	Discard wastes. Unless otherwise specified, discard catheters, rubber gloves, gastrointestinal tubes, needles, knife blades, etc., into waste receptacle in patient unit. Discard linen and wrappers into laundry bag in patient's unit.	1. Request "clean" assistant to hold open a large, steam-permeable paper bag (approved for use by CMS). 2. Slide tray and contents into open bag held by "clean" assistant. 3. Request "clean" assistant to close bag and place it at designated CMS pickup point, with attached label on bag: "Isolation Unit-Contaminated."	Designated CMS pickup area. The wrapper is clean on outside for safe handling.	Same—steam processing by autoclave in CMS before any handling of contents for final processing.
Miscellaneous: treatment and diagnostic equipment retained on the ward: (Sphygmomanometers, stethoscopes, flashlights, etc.) Items not immersible in boiling water and requiring chemical disinfection; *for example,*	1. Take from patient unit to utility room. 2. Remove all connections and detachable parts. 3. Discard all catheters, etc., that have been inserted into body cavities.	1. Provide individual equipment for the patient when possible. 2. When items must be used and returned to common use, allow time for proper cleansing and do not attempt to "keep items clean" while being used in isolation unit. 3. Use gauze or cloth saturated with 70% alcohol. Wipe items with	Utility room	Same technique, field or fixed.

leather and other porous items.	firm, twisting, friction movement on all surface, working from the top, down. 4. Follow with fresh alcohol wipe. 5. Air dry. 6. Return to common-use storage area. 7. For large, nonimmersible items with porous cover, wipe surface with moistened cloth. Expose to sunlight and air for 6 hours on every surface.

CONCURRENT CLEANING IN THE ISOLATION UNIT

1. Wear gown and mask.
2. Damp-dust all furniture and equipment surfaces within the unit daily. Use a basin of prescribed germicide and a cleaning cloth. Rinse the cloth frequently. After use, discard the cloth in the waste receptacle.
3. Dispose of cleaning solution in flush-hopper or toilet. Wash and sanitize the basin.
4. Ventilate the unit with fresh air and expose it to sunlight as much as possible. Keep door closed.
5. If responsible for floor care, use a damp mop only and prescribed germicide solution in the mop bucket. Discard solution in hopper or toilet. Discard mop head, after one-time use, in laundry bag. Scrub and rinse the mop bucket, wringer, and mop handle with clean germicide solution and airdry before returning this equipment to the cleaning closet.

NOTE

Never use floor-cleaning equipment interchangeably from isolation unit to clean areas. Although all floors are considered contaminated, this precaution reduces the spread of a known concentration of pathogenic organisms.

TERMINAL CLEANING OF THE ISOLATION UNIT

In most instances, ordinary measures as described in paragraph 5–7, are all that are necessary. Air unit for 8–24 hours, depending upon local policy, before making bed. Follow local policy for terminal disinfection of mattress and pillows when they are sent to laundry for autoclaving.

5–99. Taking TPR of Patient in Isolation

The patient in isolation has an individual thermometer setup at his bedside. The following procedure is an acceptable method of taking and recording the TPR and caring for the thermometer of a patient in isolation.

PROCEDURE

1. Before entering the unit, obtain a pencil and a paper cup containing two or three gauze squares moistened in water.
2. Place wristwatch, pencil, and cup on clean table at entrance.
3. Open one paper towel and leave it on the table.
4. Put on gown and mask.
5. Enter unit carrying paper cup, pencil, two folded paper towels, and watch in one hand.
6. With free hand, place one paper towel on bedside table with edge of towel extending beyond the edge of the table. Place watch on this towel (top side of towel and watch remain clean).
7. Place second towel, pencil, and cup on table.
8. Remove thermometer from holder containing germicide. Using water-moistened squares, wipe thermometer to remove germicide. Read and shake down thermometer.
9. Place thermometer in patient's mouth (or if rectal, lubricate and insert in rectum).
10. If necessary to hold watch while counting pulse and respiration, slide the paper towel with the watch onto your hand by reaching under the extended edge of the towel. When finished, slide paper towel with watch back on table, protecting top clean surface of towel and the watch.
11. Record TPR on second paper towel, using the pencil.
12. After removing thermometer, wipe with tissue from patient's supply. Read thermometer; discard tissue in bag.
13. Take three germicide saturated sponges from container at bedside and wipe thermometer three times, using rotary motion from stem to bulb end. Discard wipes. Return mechanically cleansed thermometer to holder.
14. Discard paper cup in waste bag.
15. Carry paper towel with watch and paper towel on which TPR is recorded from unit. Slide watch on to clean table surface and discard this towel. Place towel on which TPR is recorded on clean open towel.
16. Wash hands; remove gown and mask.
17. With clean hands, record TPR on TPR work sheet. Discard towel.

NOTE

Recording at the bedside for transcription in a clean area is recommended for accuracy; if there are any interruptions, there is less chance of forgetting the TPR reading. The pencil can be left at the bedside and replaced p.r.n.

Care of Individual Thermometer Setup

1. Keep thermometer container filled with prescribed germicide and the container of wipes replenished.

2. Once daily, take thermometer and its container to utility room.
   a. Wash container and thermometer thoroughly.
   b. Place clean cotton in bottom of container to protect tip of thermometer.
   c. Refill with fresh germicide solution and return it to unit.

NOTE

Follow local policy for terminal care of thermometer. The policy may be to discard it, with no attempt to disinfect for return to common use.

5-100. Visitors for a Patient in Isolation

Visitors must receive instructions and be carefully and courteously reminded to follow instructions. In some instances visitors (including noninvolved duty personnel) must be excluded; in others, they may be admitted on a restricted basis and in accordance with hospital regulations. Noninstructed individuals cannot be expected to understand the sign "Isolation" at the entrance to the unit; therefore, a more helpful practice is to add an additional sign such as "Visitors—Please Report To Nurses' Station For Instructions Before Entering This Room." The nurse in charge or senior NCO is then responsible for assisting and observing them. It is important to provide a coat rack or similar facility for such things as overcoats which should not be worn when entering the isolation unit.

5-101. Reverse Isolation

Reverse isolation is a protective measure ordered by a medical officer to protect the patient from contact with pathogenic organisms in the environment. It is an important part of the medical management of a patient with extensive burns or with other conditions in which the patient has a diminished ability to fight infection with his own protective body defenses. By isolating the patient and by carrying out meticulous medical and surgical aseptic techniques while providing all therapeutic and supportive measures, the patient is assured of a margin of safety in the prevention and control of infection.

a. Routine Reverse Isolation. For a patient requiring conventional protective measures, placing the patient in a thoroughly clean room, introducing only aseptic equipment and supplies and observing meticulous handwashing, gowning, and masking techniques before entering the room or caring for him may be sufficient. The door to the room is kept closed. Ventilation within the room is usually controlled by an air conditioner equipped with an air filter.

b. Use of the RES-SYSTEM. The RES-SYSTEM (Regulated Environment for Safety System) is an application of reverse isolation using a self-contained plastic isolator. The patient is encapsulated within a plastic inclosure, and care is accomplished through closed plastic sleeves. (For guidance information in the use of the patient isolator, see TB MED 275.

5-102. Preoperative Patient Care

The aim of preoperative preparation is to have the patient in the best possible mental and physical condition. The success of an operative procedure depends to a large extent upon this preoperative preparation, which begins with the admission of the patient. It is important to emphasize that any surgery, regardless of whether it is recorded as a major or a minor operation, is a major procedure for the patient, so he must be prepared both mentally and physically.

MENTAL PREPARATION

Although not ordered in writing, mental preparation is just as important as physical preparation. All persons coming into contact with the patient contribute to this mental preparation. However, as nursing personnel, you can provide major assistance since you are with the patient for longer periods of time.

1. Make every approach to the patient an opportunity to show that he is an individual.
2. Keep him informed. Often many routine procedures and special orders must be carried out, and the patient can become increasingly anxious from not knowing what to expect next. Although technical information is given only by the doctor, appropriate explanations are necessary to insure understanding and cooperation.
3. Perform all procedures in a quiet, thorough, systematic manner. This is a far more effective way to inspire confidence then merely to state that "everything is going to be all right." The patient must feel that he can place himself completely in the hands of competent individuals.
4. Remember that the patient's visiting family members need reassurance and information. A worried, poorly informed relative can transmit

anxiety to the patient. Encourage the family member to ask the doctor about the patient's condition and the proposed surgery.

PHYSICAL PREPARATION

Routine preoperative physical preparation is organized in accordance with locally prepared standing operative procedures (SOP) to avoid last minute delay, confusion, or omission of an essential detail. Specific preoperative orders for each individual patient are always written by the surgeon and the anesthesiologist; these orders always modify any routine SOP. The time required to prepare the patient varies with each case. The patient may be admitted the day before surgery, several days in advance, or only a few hours before emergency surgery. However, for purposes of this manual, the immediate preoperative preparation is discussed in two parts: the day before and the day of surgery.

Day Before Surgery

All the details to be completed in order to have the patient ready for the operating room on the scheduled day and at the scheduled hour are usually listed on a preoperative checklist. In many AMEDD hospitals, a local form is used by nursing personnel. It is placed on the front of the patient's chart holder when he is scheduled for surgery. Items listed are checked off and initialed by the responsible nursing individual as they are completed. Items that do not apply to the specific patient are either ruled out or followed by the initials "N/A" (Not Applicable). Typical items on a preoperative checklist include—

1. Check of Clinical Record for—
   a. Properly filed laboratory and other diagnostic reports—*for example,* a complete blood count (CBC), urinalysis, chest X-ray, bleeding and clotting time, blood chemistries, and electrocardiogram.
   b. Preoperative medical history and physical examination record completed by the doctor.
   c. Reports and record forms prepared for use in the OR, such as the anesthesia record, operation report, and pathology (tissue examination) forms.
2. Signed authorization for surgery (SF 522, Authorization For Administration of Anesthesia and Performance of Operations and Other Procedures). This signed witnessed consent must be obtained for all nonmilitary patients. Although not mandatory for military personnel, the policy in most AMEDD hospitals is to obtain authorization for all patients. The doctor is responsible for counseling the patient and explaining the scheduled procedure in appropriate terms. The signed dated consent must then be filed in the Clinical Record.
3. Visit from chaplain.
4. Diet order. Nothing by mouth (NPO) is usually ordered after a certain hour. Cancel diet order by deleting patient's name from diet roster after evening meal, if appropriate.

NOTE

Be sure the patient is told exactly what is permitted and up to what hour. Encourage him to force fluids up to the cutoff time and then remove his bedside water pitcher and drinking glass.

5. Skin preparation order.
6. Cleansing enema order.
7. Preoperative medication orders to include bedtime sedative the night before surgery.
8. Prosthetic appliances to be removed and safeguarded (*for example,* dentures, eye glasses, contact lenses, limbs, and wigs).
9. Valuables deposited in Treasurer's Office.
10. X-rays to accompany patient to the OR immediately available on the ward.
11. Ident-a-Band or other patient identification attached to the patient's wrist.
12. Patient instructed on night and morning procedures to be performed.

Day of Surgery

Begin preparation of the patient at least 2 or 3 hours before the scheduled hour for "on call" to the operating room. Plan activities so that they are completed before the preoperative medication is given.

1. Review preoperative doctor's orders.
2. Review preoperative checklists to make sure no preliminary routine details have been omitted.
3. Take and record TPR and BP. Report any abnormal findings immediately to the ward nurse or doctor. Report and record any sign of an upper respiratory infection—cough, sniffles, or sore throat.
4. Give morning care. If a cleansing bath has not been given the preceding evening, give bath or have patient shower if time and the patient's condition permit. Cleanse or assist

patient to cleanse mouth and teeth thoroughly. Comb hair. Assist male patient to shave. Remove all hair pins, nail polish, and lipstick from female patient.

5. Remove, identify, and store prosthetic appliances, if any, in the bedside table. Place clean dentures in clean water in a labeled denture cup.
6. Dress patient in accordance with the local SOP. This may stipulate that no clothing is worn to the OR or that a clean pajama coat may be permissible, worn back to front, and left unbuttoned.
7. Check to be sure all valuables have been turned in to the Patient's Trust Fund Depository (cash, checks, wristwatch, and other jewelry). If the patient wishes to wear a wedding ring, secure it by a loop of gauze bandage tied to the wrist.
8. Have patient void before giving preoperative medication. Measure and record amount of urine on Nursing Notes.
9. Give prescribed medication as ordered. Caution patient not to attempt to get out of bed after receiving it. Use bedrails if necessary.
10. Do not allow the patient to smoke after receiving medication—remove cigarettes and matches from his bedside table if necessary.
11. Escort the OR technician to the preoperative patient. If the patient is alert, identify by asking his name. If heavily sedated or not conscious, check his bed card and wristband.
12. Assist the OR technician in transferring the patient to the stretcher.
13. Check Clinical Record for final notations and all necessary forms. Complete all entries on Nursing Notes, Doctor's Order, and checklist p.r.n.
14. Give Clinical Record including X-ray folder to the OR technician.

Transportation of the Patient to the Operating Room

The patient is usually transferred to the OR by OR personnel. However, if this is a responsibility of ward personnel, the following precautions must be observed:

1. Cover the patient with a clean cotton sheet and a clean cotton blanket. The amount of covering will depend upon the temperature and draftiness of corridors through which he is to be transported.

WARNING

If a woolen blanket must be used, the blanket is removed before entering the OR suite because of the danger of static electricity in an area where anesthetic gases are used.

2. Secure stretcher straps, one at the chest and one just below the knees before leaving the bedside. Do not apply straps tightly. Explain to the patient that they are for safety.

NOTE

If patient is transported in his bed, always have bedrails in up position.

3. When transporting the patient, never leave him alone and unattended. An assistant is often needed to hold open the elevator and corridor doors.
4. Push the stretcher feet first. Do not push it too fast, and keep it under control at all times. Use care in going through doorways and around corners.
5. Upon arrival at the OR remain with the patient just at the door or entrance until met by a responsible OR individual. Check the patient's identity with this individual and turn over the Clinical Record and the patient to his custody.
6. If the patient is awake, introduce him by name to the new individual. This is a source of reassurance to the patient in the new and mystifying atmosphere.
7. Always find out if the stretcher or bed used is to be returned immediately to the ward or left in the anteroom. (When the ward stretcher or the patient's bed is used, the patient is transferred to an OR stretcher or mobile table for movement into the OR suite.)

5-103. Skin Preparation

Skin preparation for surgery ("surgical prep") consists of cleansing and shaving an area of skin sufficiently large to provide an ample clean field for the specified operative procedure. The area to be shaved is ordered by the doctor. The procedure is often done by OR personnel but is also performed by ward personnel. Although it is preferable to bring the patient to a treatment room because of better facilities, the entire procedure can be done at the bedside. It is usually done the day or evening before surgery.

EQUIPMENT

Instrument tray (15 by 9 by 2 inches) with the following prep equipment:

Safety razor

New razor blades
Scissors
Solution basin, 2
Emesis basin
Water
Surgical soap (as prescribed)
Gauze fluffs, 12 or more
Cotton-tipped applicators
Orangewood stick
Nail clippers p.r.n.
Hair clippers p.r.n.
Plastic-backed paper pad or rubber treatment sheet with cover
Waste container (paper or plastic bag)
Floorlamp

AREAS OF SKIN PREPARATION

Areas customarily prepared for specified operations are illustrated in appendix C. (A general rule followed by experienced operating room personnel can be expressed as "when in doubt, prepare an area extending 12 inches in all directions from the proposed incision.") Since the prepared area is always more extensive than required for the incision itself, the patient must always be told this and reassured.

GENERAL PRECAUTIONS

Observe the following precautions when preparing the skin area:

1. Avoid scratching or nicking the skin. Cuts and scratches are a potential source of infection.
2. Check the doctor's order or the local policy manual for the required skin cleansing agent.
3. If a surgical soap such as a hexachlorophene detergent preparation is used, do not use other soap solutions, acetone, ether, or alcohol with it. These chemicals will neutralize the residual antiseptic properties of the prescribed detergent. If a solvent such as ether or acetone is required to remove adhesive marks or nail polish, use the solvent first and then wash it off.
4. Report any signs of pimples, a rash, or an inflammation about the operative area.

PROCEDURE

1. Check doctor's order. Know area to be prepared. When no specific instructions are given, follow the instructions below and refer to appendix C.
2. Identify the patient and explain the procedure to him.
3. Screen the patient to provide privacy. Position him to provide complete exposure of area and place protective pad under area. Adjust the light to the best angle to see hairs.
4. Wash hands.
5. Using solvent and gauze sponges, remove all adhesive marks and any fingernail polish from nails.
6. Cut off excessive hair with scissors.
7. Moisten gauze, add several drops of detergent, and lather one small area at a time, using a rotating motion. Start at the center and work outward.
8. Using cotton-tipped applicators and orangewood stick, clean all identations such as the umbilicus, toe, and fingernails, if included in the operative area.
9. Reapply lather and shave the clean skin. Apply tension by pulling the skin taut, use short strokes, and shave in the direction of hair growth. Remove lather and hair from razor blade with paper tissue. Rinse the shaved area with clear warm water, using clean fluffs. Blot dry.
10. Inspect the shaved area by viewing in good light at eye level. Reshave where needed.
11. Instruct patient to take a shower and shampoo after shaving is completed if he is physically able. Give him the same detergent used for the skin prep. Provide him with clean towel and clean pajamas. (His bed should be made with clean linen.)
12. Discard soiled sponges, applicators, and used razor blades.
13. Rinse and return basins, razor, scissors, and clippers to CMS for autoclaving.
14. Reassemble clean skin prep tray.

5–104. Orthopedic Skin Preparation

In most Army Medical Department hospitals, the orthopedic skin preparation is done the day before the scheduled date of operation by an orthopedic specialist. The patient is often sent or transported to the orthopedic cast room for the procedure. In general, the orthopedic skin preparation includes shaving as in the routine procedure, followed by a 5-minute scrub of the entire area. When the prepared area is to be draped, as well as shaved and scrubbed, the entire prepared area is covered with sterile towels secured with an elastic bandage or stockinet. (Adhesive tape to secure the towels to the skin is not recommended.) Nursing personnel on the ward must be informed about activity re-

strictions for the patient on his return to his ward from the preparation area; for example, following preparation of lower extremity, back, and neck, patients remain in bed until time of operation; or following preparation of shoulder, arm, and hand, patients may be up and about but must remain on the ward.

NOTE

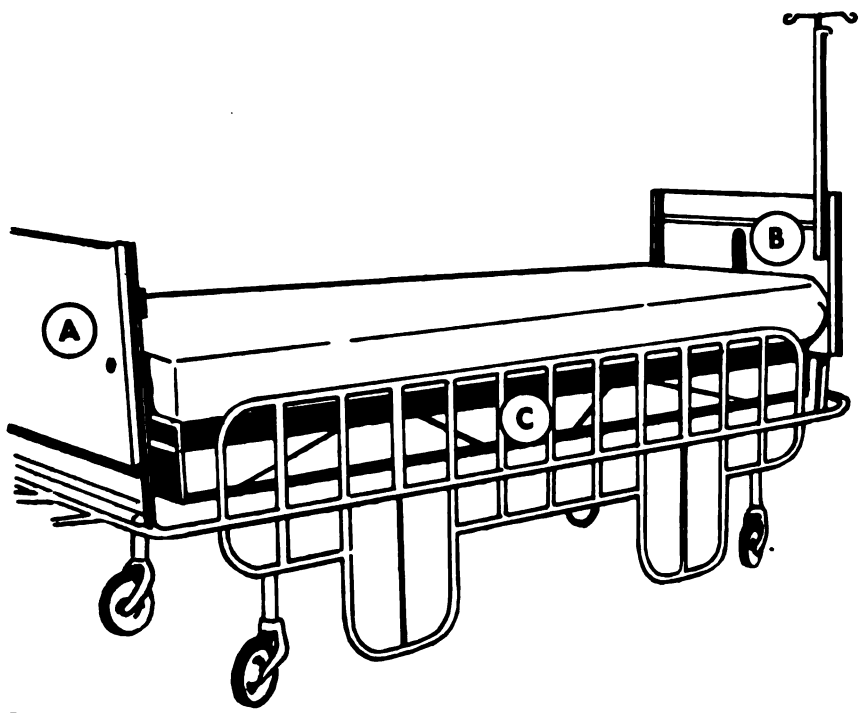
For some patients, this restriction means that they do not go to the dining room for the evening meal, and ward personnel must therefore notify Food Service to provide tray service on the ward.

5-105. Preparation of Recovery Bed Unit

Routine preparation for postoperative patient care is completed while the patient is in the operating room. The patient unit is prepared to receive the patient, to include having in readiness any special equipment needed. In Army Medical Department hospitals, the patient is usually scheduled by the surgeon to go directly from the operating room to recovery ward until fully reacted from anesthesia; he is then returned to his assigned ward for continuing care. The medical specialist assisting with preparations for postoperative care should follow these preliminary steps:

a. Check the OR schedule. Note the type of operation and anesthesia listed. Discuss these facts with the head nurse or designated nursing team leader and review both general and special aspects of nursing care for the patient. This preliminary review of the proposed operation and anesthetic is a basic requirement for knowledgeable assistance with subsequent preparations.

b. Know what factors are considered in locating the postoperative patient unit within the ward. The optimum location may be in a multibed ward or in a single room. Other patient's units may have to be shifted; this must be done with minimum confusion. Important factors in the physical location of the unit include: the requirement for close and continuous observation of the patient; proximity to available in-wall oxygen, suction, and electrical outlets; and adequacy of space, light, and ventilation with no drafts.



(A) FOOT BOARD (REMOVABLE), WITH TRACTION OPENINGS.
(B) HEAD BOARD (REMOVABLE), WITH TRACTION OPENINGS.
(C) OPERATING INSTRUCTIONS (PRINTED PANEL ON CENTER OF BED FRAME).

Figure 5-78. Anesthesia recovery bed.

PREPARATION OF THE PATIENT UNIT

Start with a clean, freshly washed bed. The bed may be the standard hospital bed or a special "recovery bed" (Hill-Rom type, fig. 5–78).

Equipment

For The Bed
- Sheets, 4
- Laminated cotton drawsheet, 1
- Rubber treatment sheet, 1
- Pillowcases, 2
- Pillows, plastic covered, 2
- Cotton blanket, 1
- Siderails, 2

For The Bedside Stand
- Bath towel, 1
- Hand towel, 2
- Washcloth, 1
- Paper bag
- Emesis basin
- Box of Tissues
- Mouth wedge (prepared by taping together 2 tongue blades and padding one end with gauze)

Sphygmomanometer
Stethoscope
Pencil and paper

Procedure (Standard Hospital Bed)

1. Place the bottom (foundation) sheet and the drawsheet in the usual manner.
2. Place the rubber treatment sheet to protect the upper third of the foundation. Cover the rubber sheet with a cotton sheet folded hem to hem, and placed so as to overlap the drawsheet by 3 to 4 inches. This head-of-the-bed protection is provided to protect the foundation sheet from soiling by vomitus. It is an optional measure when no vomiting is anticipated; for example, in preparing the bed for a fully reacted patient returning from the recovery room.
3. Place the top sheet and blanket as for the unoccupied bed (para 5–12). Do not tuck under at the foot of the bed.
4. Fold the sheet over the blanket to form a cuff at the head and at the foot of the bed, with the fold at the foot of the bed even with the mattress.
5. Fan-fold the cuffed top covers lengthwise to the far side of the bed (the side away from the room entrance).
6. Fit the pillows into the pillowcases. Place one pillow upright at the head of the bed, securing the ends between the rungs. Place the second pillow on the chair.
7. Arrange equipment on the bedside stand.
8. Move the bedside stand and chair to provide space for a stretcher parallel to the bed on the side facing the entrance.
9. Attach bedrails and leave in down position.

Other Needs

1. Obtain other equipment that may be needed and place in readiness at the bedside: IV stand; sterile urinary drainage bottle and tubing; oxygen equipment; suction apparatus.

NOTE

One of more types of suction apparatus may be required; *for example,* one for gastrointestinal suction and one for airway.

2. Make sure all apparatus is in working order before the need to use it arises, in order to avoid loss of time and distraction of attention from the patient.

5–106. Postoperative Nursing Care

Nursing measures to prevent complications, to prevent and relieve postoperative discomforts, and to promote early restoration of normal body functions are begun as the patient is transferred from the operating room to the designated patient unit. Postoperative nursing measures may be classified as (1) immediate care measures, applied while the patient is reacting (regaining full consciousness) from anesthesia, and (2) early care measures applied following reaction from anesthesia, when the patient is conscious and able to respond to specific requests and directions. In most AMEDD hospitals, the patient receives immediate and early care in the surgical recovery unit (recovery ward); the nursing care that is begun in the recovery ward is continued when the patient is transferred to a general (or specialized) postoperative ward. The enlisted specialist who is assisting with care of the postoperative patient must understand that while different phases of care—immediate, early, and progressive convalescent as the patient becomes self-sufficient —are usually carried out in different ward settings, all phases are part of the total care of the patient, and none are considered as unrelated segments.

5–107. Immediate Postoperative Care

a. General. This is care given on reception of the patient from the operating room and continued until the patient is fully conscious and has re-

gained his protective reflexes (gagging, swallowing, and purposeful movements). During this period, observe the following general precautions:

(1) Never leave a patient alone, unobserved, and unattended during the period of recovery from anesthesia.

(2) Be constantly alert to the possibility of respiratory obstruction, shock, and hemorrhage. The period of recovery from anesthesia and the first few hours after surgery are periods of danger. Report any signs noted and any doubts about any sign or symptom.

(3) Be aware of specific orders to be carried out, specific symptoms for which to be alert, and any complications which may develop and which may modify any of the general nursing care measures discussed in this section.

NOTE

Immediate postoperative nursing care is customarily under the direct supervision of a professional nurse, who evaluates the patient's condition, checks orders, sees that they are carried out, instructs the enlisted specialist who is assigned to help care for and stay with the patient, and keeps the enlisted assistant informed.

As soon as possible, the enlisted specialist reviews and discusses the operative procedure, the postoperative orders, and the patient's condition with the nurse so that he is fully informed and can therefore be of maximum assistance; this discussion should not take place at the patient's bedside.

b. Transfer of Patient From OR Stretcher to Recovery Bed. An anesthetist customarily accompanies all anesthetized patients, supervises and assists with the transfer and positioning, and alerts ward personnel to specific precautions. Unless you are otherwise ordered, observe the following precautions:

(1) Lock bed wheels before transfer is started.

(2) Prepare to assist with a 4-man, lift-sheet transfer (fig. 5–79).

(3) Follow anesthetist's instructions and signals to coordinate all movements.

(4) On signal, lift gently and smoothly. Jarring the patient's body and rough handling may overtax his circulatory system and be a factor in producing shock. The control of lifting and trans-

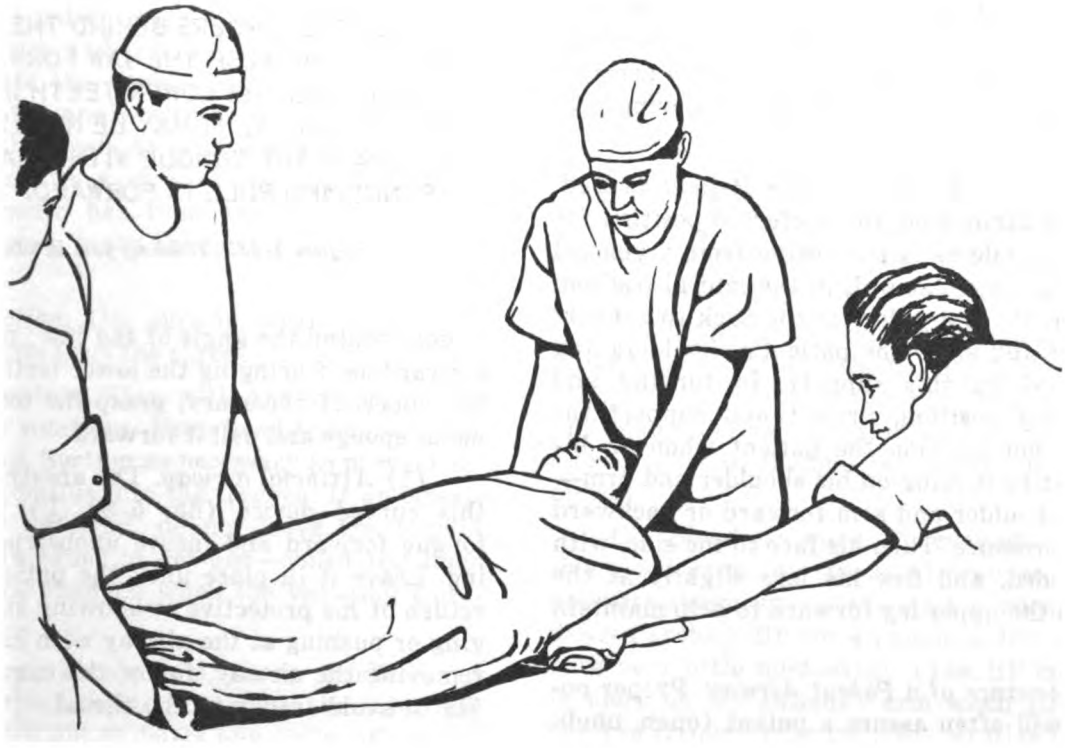


Figure 5–79. The 4-man lift sheet transfer.

Figure 5-80. Lateral position.

ferring movements is so important that the bed is brought to the OR for some patients in order to minimize handling.

(5) Use good body mechanics. Keep the patient's body straight, supporting head and extremities. Avoid straining yourself. Designate the tallest assistants with the longest arms for the lifting posts at either side of the bed and stretcher.

(6) Remember that the anesthetized patient must have his relaxed extremities and joints supported and kept in good alinement to prevent nerve damage from pressure and to protect muscles and joints from strain. Do not allow arms or legs to dangle during any lifting and moving procedure.

c. Assist With Positioning the Patient in Bed. Unless contraindicated, the preferred position for the patient while he is recovering from a general anesthetic is on a flat bed, in the lateral position (fig. 5-80). Place a pillow at the back to support the patient and allow the patient's shoulders and back to rest on this support. In turning and changing his position, protect and support the joints. Do not position the patient when on his side so that he is lying on his shoulder and arm—bring the shoulder and arm forward or backward to relieve pressure. Turn his face to the side, with chin extended, and flex his legs slightly at the knee, with the upper leg forward to help maintain position.

d. Maintenance of a Patent Airway. Proper positioning will often assure a patent (open, unobstructed) airway. It may be necessary to hold the lower jaw forward (fig. 5-81) to prevent the tongue from falling back into the throat. Place the

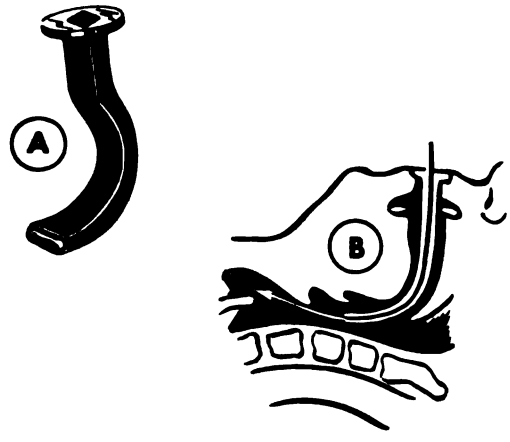
PLACE THE FINGERS BEHIND THE ANGLE OF THE JAW; PUSH THE JAW FORWARD AS IF BRINGING THE LOWER TEETH IN FRONT OF THE UPPER. IT MAY BE NECESSARY TO GRASP THE TONGUE WITH A GAUZE SPONGE AND PULL IT FORWARD.

Figure 5-81. Holding jaw in place.

fingers behind the angle of the jaw; push the jaw forward as if bringing the lower teeth in front of the upper. If necessary, grasp the tongue with a gauze sponge and pull it forward.

(1) *Artificial airway.* The anesthetist inserts this curved device (fig. 5-82 Ⓐ) to hold the tongue forward and insure unobstructed breathing. Leave it in place until the patient indicates return of his protective swallowing reflex by gagging or pushing at the airway with his tongue. In removing the airway, follow the curve (fig. 5-82 Ⓑ) to avoid injury to the throat.

(2) *Respirations.* Observe and note respirations. Pay immediate attention to noisy, snoring respiration; these usually indicate the relaxed



IF THE PATIENT HAS HAD AN AIRWAY (A) INSERTED (B) DURING SURGERY, IT IS LEFT IN PLACE UNTIL THE PATIENT ATTEMPTS TO COUGH IT OUT.

Figure 5–82. Airway in place.

tongue has fallen back into the throat and is obstructing the airway. If this occurs—

(a) If movement of the patient is permitted, immediately roll patient from his side to his abdomen with his head down over the side of the bed. This will allow the relaxed tongue to fall forward.

(b) If patient cannot be turned, open the patient's mouth and pull his tongue forward. To do this, locate the angle of the jaw bone, press forward on the angle with thumbs and down on the chin with fingers to separate the teeth. Place the padded mouth wedge between the back teeth when the mouth has been opened. With gauze-wrapped fingers, grasp the tongue and pull it forward.

(3) *Suction.* Use suction when required to clear secretions from the throat.

(4) *Vomiting.* Stay with and assist the patient during vomiting. Keep head turned to side, chin extended. Suction as necessary to prevent aspiration of vomitus into the trachea. If an emesis basin is not on hand, do not leave the patient unattended in order to get one—soiled bed linen can always be changed when the vomiting emergency is over.

e. Dressing. Locate and check condition of dressing. Inspect the top layer, at the sides and beneath the patient to detect any oozing. Continue observations at frequent intervals. Look for blood stains on the bottom sheet, and note and report immediately the character and amount of bleeding or any drainage. Reinforce top layer of dressing if necessary, but never remove any original layers.

f. Drainage Tubing and Catheters. Locate and check all drainage tubing and catheters. Follow orders for unclamping and connecting to drainage bottle or suction. (Urinary catheters are usually attached, unclamped, and allowed to drain immediately. Chest catheters are attached to drainage or suction by the surgeon.)

(1) Secure tubing to bed as required to prevent tension and permit movement of the patient.

(2) Check at frequent intervals to be sure all tubes and catheters are free of kinks, open (or properly clamped), and not collapsed by being caught under the patient's body or by being pinched in the bedrails.

(3) Note the character and amount of drainage and any changes.

g. IV Tubing and Needle Location. Check IV tubing and needle location. Keep flow at prescribed rate. Be alert to any signs or symptoms of reactions. Use an arm board to prevent needle displacement if the patient is restless.

h. Vital Signs. Take pulse, respiration, and blood pressure while anesthetist is still present. Report initial measurements verbally to the anesthetist and record them on the bedside record. Take and record pulse, respiration, and blood pressure at specified intervals, usually every 15 minutes until otherwise ordered. Report any marked variations at once.

(1) *Pulse.* Count pulse for 1 full minute. Note rate, quality, and character. Report a pulse above 90, one below 60, and sudden increases or decreases verbally as well as by recording.

(2) *Respiration.* Count respirations for 1 full minute. Respirations should be quiet, effortless, deep, and uniform (16 to 20 per minute). Report any changes in rate, rhythm, and sound. Stay constantly alert to changes indicating an obstructed airway.

(3) *Blood pressure.* To evaluate postoperative blood pressure, the usual preoperative blood pressure should be known. As a general rule, the desired systolic BP for an adult is 100 and above, with very little fluctuation. (The BP cuff is kept in place on the patient's arm when BP is being checked frequently in the postoperative period.)

(4) *Temperature.* Take rectal temperature with initial vital signs measurements and at least

every 4 hours thereafter for the first 24 hours. Thermometer must be held in place for unconscious patient.

(5) *Skin color and temperature.* Note color, warmth, moisture, and general appearance (blotchy, rash, or reddened areas). Cold, moist ashen skin and pale color of lips, conjunctiva, and nailbeds are important signs of unstable circulation and possible lack of oxygen. With dark-skinned individuals, note particularly the color of nailbeds, temperature of finger and toe tips, and color and skin temperature of ear lobes. These checkpoints indicate adequacy of peripheral circulation.

i. State of Reactivity. Note the patient's state of reactivity. The term reactivity refers to the patient's return to consciousness (awakening) following the administration of a general anesthetic. He is said to be fully reacted when he is fully conscious. With modern methods of administering anesthesia, many patients have begun to react on return from the operating room. Partial reaction may therefore take place within a few minutes after surgery is completed, although full return to consciousness takes longer.

(1) *Signs of partial reactivity.* The patient begins to move his extremities, swallows, blinks his eyelids, and moves his tongue in attempt to expel an airway if one is present. He may groan or speak a word or two. During this period, you should—

(*a*) Always continue close observation and be in constant attendance. Vomiting may occur and the danger of aspiration is great.

(*b*) Speak reassuringly. Call the patient by name in a low, calm voice. Tell him the operation is over and that he is back in his bed again. Avoid loud noises. Avoid conversation at the bedside. Be exceptionally careful about what is said within his hearing. He may appear very groggy and cannot respond appropriately, but he can often hear and remember remarks made when he is only partially conscious.

(*c*) Control his involuntary, restless movements by gentle hand pressure or by tucking in the top covers snugly but not tightly. Increasing restlessness must always be reported immediately —this may be a sign of impending hypoxia or possible hemorrhage. As the patient begins to move about, check vital signs stat. for any variations from previous measurements. Check position and functioning of drainage tubes for possible displacement. Check dressing for bleeding or loosening of adhesive.

(2) *Signs of full consciousness.* The patient will make coordinated movements in response to definite requests—*for example,* he will squeeze your hand on request, take a deep breath, attempt to whistle, answer to his name, understand questions, and show he is oriented to time and place by remembering where he is and perhaps by recognizing personnel and remembering their names.

CAUTION

Protect the partially conscious or fully conscious but groggy patient, from falling out of bed. Use bedrails as well as close observation. Leave bedrails in up position at all times on the unattended side of the bed and to the maximum extent possible on the attended side.

(3) *Special observations for spinal anesthesia.* With spinal anesthesia the patient remains conscious, although he is usually drowsy from preoperative medication. In addition to having numbness of the trunk and extremities, he may have respiratory or circulatory depression, so he must be observed closely until vital signs become stable. He must have specific care measures because of the operative procedure but you must also observe the following precautions:

(*a*) Be alert to all irregularities in vital signs.

NOTE

It is not unusual for the blood pressure to be lower than normal during the immediate care period.

(*b*) Keep patient flat in bed until otherwise ordered (one pillow under the head may be permitted.) An initial supine position, careful turning, and no unnecessary movement for 6 to 12 hours may be ordered to minimize possibility of headache. Headache attributed to spinal anesthesia may occur 24 hours postoperatively.

(*c*) Note and record time of return of motion and sensation in lower extremities.

(*d*) Avoid pressure and strain on numb extremities. Support in good alinement.

5-108. Early Postoperative Care (After Patient Reacts)

a. General Precautions.

(1) Continue close observation of dressing.

(2) Make sure all drainage tubes are functioning.

(3) Be alert to any irregularities in vital signs as increased activities and nursing measures are started.

(4) Report observations immediately to the nurse or doctor for evaluation and additional instructions on modifications of care.

(5) Alternate periods of rest and activity as much as possible to allow your patient to recuperate from the mental and physical strain of the operation. During the first 24 to 48 hours the patient needs as much rest as he can obtain, but he must also be assisted and encouraged to carry out controlled exercises and activities that are absolutely necessary to prevent complications. Explain that he will benefit from activities that he may not feel ready for or that he fears may cause pain.

(6) Watch for and report immediately signs and complaints of pain. Medication for pain is usually given before the patient becomes intensely uncomfortable. When pain is relieved, he can relax and is better able to cooperate in moving and learning how to help himself toward recovery.

(*a*) Investigate possible contributing causes of pain and discomfort such as a need for position change, adjustment of drainage tubing, or easing of constricting binders or dressings. Appropriate comfort measures will enable the patient to receive maximum benefit from the prescribed drug.

(*b*) Medication orders usually are written for some narcotic and the order is apt to be for p.r.n. administration, indicating that the doctor is relying on the knowledge and judgment of the nurse. It is accepted policy that such medications are given only by the nurse or under the direct supervision of the nurse. In reviewing the written orders, you should note that there is usually a reduced dosage of narcotics, hypnotics, or any drug with a sedative or tranquilizing effect for the immediate or early postoperative patient. The amount of drug may be increased in a subsequent order as the patient's condition becomes stabilized and the lingering effects of the anesthetic wear off. Meperidine hydrochloride is an example of a narcotic drug frequently ordered to relieve postoperative pain; it has effects similar to morphine but with less depression of respirations.

(7) Continue to use side rails on the bed when there is any doubt about the patient's alertness and orientation. Side rails also provide support and give the patient something to pull on as he learns to assist himself in turning.

b. General Nursing Measures. In many respects, postoperative nursing measures parallel those employed for any patient requiring skilled and intensive care. The care initiated in the immediate postoperative period and carried through day and night, for the first several postoperative days will often prevent serious complications and can mean the difference between the success or failure of the surgery performed. Unless otherwise ordered, the following are considered routine postoperative nursing measures:

(1) Provide comfort and hygiene care. Start by washing his face and hands. Allow patient to rinse his mouth with plain water when he is fully conscious. Elevate the head of the bed slightly unless orders are to lie flat. Place one pillow under the patient's head. As soon as possible, give him a partial bath since most patients will have perspired heavily. Rub his back with lotion and inspect all bony prominences for signs of pressure. Change damp or soiled linen, removing postoperative protective linen when no longer required. Put clean pajamas on, reversing the jacket back to front as necessary. Assist him to brush his teeth. Replace dentures as soon as possible as an aid to both mental and physical comfort.

(2) If nothing by mouth has been ordered, plan to give mouth care every 2 hours. Allow the responsive patient to rinse his mouth frequently with plain water; if he is not allowed to rinse his mouth, wipe his lips and tongue with wet gauze. When preoperative medication such as atropine sulphate has been given to help control secretions during anesthesia, excessive dryness of mucous membranes may persist for several hours postoperatively. The patient often feels as if he has a mouth full of cotton, and moisture for his mouth and lips is an important comfort measure.

(3) Assist with position changes, alternating back and side-lying position at least every 2 hours. Use good body mechanics. Show the patient how to move and change his position within permissible limits, with the least strain and discomfort. (Follow methods discussed in paragraphs 5–15 through 5–18 for position changes and maintenance of good body alinement.)

(4) Check functioning of drainage tubing and condition of dressing during and after each change in position.

(5) Encourage deep breathing to insure good lung expansion and aeration of lung tissue. Show

the patient how to breathe deeply by placing his hand on his abdomen to feel the pulling in of abdominal muscles with a deep inspiration. Tell him to take 10 such deep breaths every hour and check to see that this is done.

(6) Keep accurate record of intake and output.

(*a*) *Intake.* When oral fluids are permitted, start with sips of cool (not iced) water. As initial small amounts are tolerated, with no nausea or vomiting, encourage intake of water frequently but not excessively at any one time. Up to 200 ml. per hour taken in small amounts at a time may be permissible to help restore and maintain fluid balance. Because of fluid loss during surgery, parenteral fluids are often ordered during the first day to supplement oral intake. When a regular or other solid-food diet is ordered for the first or second postoperative day, encourage the patient to eat as much as he can of the food served. Some patients are very reluctant to eat, fearing nausea or vomiting, and they need encouragement. Do not be too insistent. Report progress or failure with food intake after each meal.

(*b*) *Voiding.* Note frequency and amount voided. Report immediately if patient has not voided within 8 hours following return from OR. The bladder may tend to hold accumulated urine for a longer period of time than usual following surgery, but after 8 hours, provision must be made to relieve the distended bladder and the discomfort that results from urinary retention. The doctor will order catheterization when necessary, but you may try other measures first. If permissible, get the patient out of bed. Help the male patient to stand to void; seat the female patient on a commode or place a warm bedpan on the chair. Apply warm moist towels to the suprapubic region and pour warm water over the genitalia.

(7) Assist the patient to cough effectively. Coughing is encouraged in order to clear mucous secretions from the bronchi, unless contraindicated (*for example,* following surgery on the eyes, brain or spinal cord when coughing may cause excessive internal pressure changes). If secretions are allowed to accumulate, they block the bronchi and prevent air from reaching lung tissue. Effective coughing, deep breathing, and change of position are all measures which help prevent atelectasis, a serious condition of lung collapse due to incomplete aeration of lung tissue. Atelectasis can occur within 24 hours postoperatively if preventive measures are neglected or not carried out effectively on the recommended hourly or every 2-hour basis. When coughing is prescribed, teach and assist the patient to cough effectively. It is often a painful experience and maximum assistance is needed. Otherwise the patient will try to suppress the cough or will "hack" or merely clear his throat. He can cough most effectively when sitting upright, with his incision firmly supported by manual pressure to prevent undue strain. The following method of assisting the patient is recommended:

To Assist Patient to Cough (Sitting Upright)

- Using good body mechanics, assist the patient to sit upright in bed. Provide him with a pull rope attached to the foot of the bed to help him to sit up and maintain his position. Looped web belts (stretcher straps or trouser belts) can be used for an effective pull rope.
- Hand him several tissues, folded in layers, to "cover the cough."
- Stand at his side, placing your hands firmly on either side of the incision. As an alternative to splinting the incision with the hands, use a bath towel folded lengthwise; center it over the operative area and grasp both ends.
- Instruct the patient to inhale deeply, to cough on exhalation, and to expectorate coughed-up secretions into the tissue. As he exhales and coughs, exert pressure on the incision with hands or towel splint.
- Repeat cough procedure. Three successive deep coughs are often necessary to clear the bronchi.
- Inspect used tissue to note secretions before discarding in bedside waste bag.
- Assist patient to comfortable resting position.
- If coughing procedure causes fatigue only and no production of sputum, report this immediately.

To Assist in Coughing When Patient Cannot Sit Up

- Turn patient to supine position, with head of the bed elevated to permissible limit.
- Remove restraining bed clothing from chest area.
- Proceed as in steps above.

(8) Assist with prescribed bed exercises and early ambulation to help restore normal functioning of all body systems. Both of these measures when started within 24 hours after surgery may prevent thrombus (clot) formation in the venous

circulation, particularly in the pelvis and lower extremities.

(*a*) *Bed exercises.* One recommended series of lower extremity exercises can be started as soon as the patient is permitted to move about in bed. (More specialized exercises are usually taught and supervised by physical therapy personnel.)

CAUTION

Loosen bed linen so that there is no constriction of legs or feet.

- Turn patient to supine position, with bed flat.
- Tell patient to: bend his knees, straighten his knees and, when legs are fully extended, try to push the backs of his knees hard against the mattress, holding this pushing movement for 5 seconds. Then tell him to relax, take two deep breaths, and repeat the movements at least 5 times.
- To check on his ability to do this active exercise, slip your hand, palm down, under the popliteal area when his leg is fully extended, and tell him to concentrate on pushing down the back of his knee against your hand.

NOTE

When done successfully, this part of the leg exercise is called quadriceps setting. Quadriceps setting is often prescribed when no other lower extremity movement is possible; it contracts thigh and calf muscles and helps maintain muscle tone and circulation. Encourage and remind the patient to repeat the "setting" exercise at least every 2 hours. Check on his ability to do it as instructed by supervising him at least every 4 hours.

(*b*) *Early ambulation.* Early ambulation means getting the patient out of bed and assisting him to walk (often within the first 12 hours postoperatively). This may be a very complex procedure, requiring a high degree of nursing skill and judgment. It must be done when ordered, while at the same time continuing treatment with IV fluids, drainage tubes, indwelling urinary catheters, and all other complicating treatment factors. In addition to the management of the understandably apprehensive and wobbly patient, all the treatment equipment must be maintained in operational order.

To Assist the Patient to Ambulate Postoperatively

- Check vital signs before getting the patient up. If in doubt as to the patient's condition, report observations to the nurse or doctor and request evaluation.
- If drainage tubes are present, find out which may be clamped off temporarily and which must continue to function. In general, nasogastric tubes may be clamped and disconnected from the drainage bottle but urine-drainage catheters are left open, to continue to drain into a portable drainage bottle.
- If IV fluids are to continue, secure the patient's arm to an arm board. Hold the bottle at shoulder height or hang it on a mobile pole and push the pole as the patient walks.
- Check dressing and reinforce as necessary. If a binder is used, make sure it is applied smoothly and securely while the patient is flat in bed to provide the required support.
- If supporting elastic bandages or stockings are ordered, apply them while patient is in bed and supine.
- Dress patient in pajamas and robe. Secure all fastenings so that there will be no exposure and so they will fit properly, in order to avoid having the patient worrying about holding up his trousers while attempting to stand and walk.
- Provide well-fitting slippers or shoes so that the patient can walk and not shuffle. If muslin scuffs are used, select an appropriate size and tie them securely.
- Using good body mechanics, assist the patient to sit upright at the side of the bed. When he feels secure, assist him to stand at the side of the bed. Have an assistant present if needed.
- Stand beside the patient and walk close to him. Encourage him to stand upright and to breathe deeply. Most patients tend to bend over, to clutch their incision, and to be understandably apprehensive. A recommended method to provide maximum support for a weak patient is to link arms so that the patient's palm is up and the assistant's palm is down. If the patient starts to sway or lose balance, the assistant can immediately slide his arm up into the patient's axilla and balance the patient against his hip.
- Assist the patient to walk the recommended distance before returning him to a chair or to bed.

5–109. Postoperative Complications

The complications discussed in this section are not limited to postoperative situations—they may occur with other conditions of disease and injury. It is important to remember that when resistance is lowered, as it is following surgery, complica-

tions can develop and one complication can follow another. Good preoperative and postoperative care prevents many of the complications that were once fairly common. The skilled medical specialist should know the types of complications which may occur, actions he can take to help prevent them, the significance of early signs and symptoms, and the basic principles of treatment. Complications to be particularly aware of are shock, hemorrhage, circulatory problems (other than shock and hemorrhage); respiratory problems; gastrointestinal problems, and fluid balance problems.

SHOCK

a. Definition and Causes. Shock is a body reaction to injury or disease; it is a condition in which there is not enough blood in circulation, to fill the vascular system. As a result of ineffective circulation there is interference with the basic physiologic process of the blood stream—delivering oxygen and other essential elements to body tissues and removing waste products. Reduction of blood volume in circulation can result from—

(1) Actual loss of blood through internal or external hemorrhage.

(2) Loss of plasma, the fluid part of blood, by seepage into tissues at the site of injury, as in burns, contusions, and crash injuries.

(3) Excessive loss of fluids and electrolytes from the intestinal tract through severe vomiting, diarrhea, and continued gastrointestinal suction.

(4) An abnormally sudden increase in the capacity of the vascular system (vasodilation). Many blood vessels dilate at the same time and, although there is no actual loss in the amount of blood, blood fails to move along in the dilated vessels.

b. Signs and Symptoms. The signs and symptoms of shock are all related to ineffective circulation and depression of vital body processes. The signs and symptoms listed below may not be equally prominent or appear in every patient, but they are representative of the picture presented of the patient in shock (fig. 5–83).

(1) Pale, cool, moist skin.

(2) Falling blood pressure.

(3) Weak, rapid, thready pulse.

NOTE

A progressively falling blood pressure combined with increasing pulse rate are two of the most important signs.

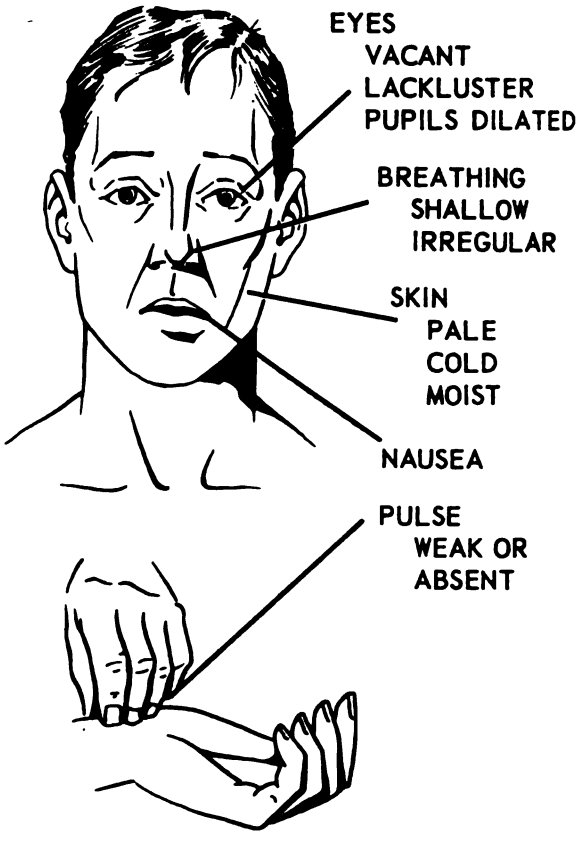


Figure 5–83. Patient in shock.

(4) Rapid, shallow respirations.

(5) Anxiety, changing to listlessness and apathy.

(6) Staring or vacant expression in the eyes. The pupils are apt to be dilated unless morphine has been given recently.

c. Prevention Measures. Shock should be anticipated in all individuals subjected to known causes of shock—physical and emotional stress, any severe injury, loss of blood, or loss of other body fluids. Accident victims and postoperative patients are in this category. Shock may develop slowly; the characteristic signs may not appear for several hours. In incipient or impending shock (shock that has not yet developed), none of the signs may be present, but preventive measures should be taken as follows:

(1) Keep patient horizontal so that available circulating blood does not have to move against gravity. If the patient must be moved, move him gently.

(2) Cover lightly to conserve body warmth. Avoid overheating because this contributes to dilation of peripheral blood vessels.

(3) Use prescribed sedative and analgesic drugs cautiously. Relief of pain is desirable, but these drugs also tend to depress the mechanisms of the central nervous system which control and maintain blood pressure.

(4) Maintain a quiet, calm atmosphere to reassure the patient and make him feel secure.

(5) Observe vital signs frequently and regularly to detect irregularities and sudden changes.

d. Treatment Measures. While complete treatment depends upon the underlying cause, emergency measures include the following:

Treatment Measures for Shock

1. Place two pillows beneath the patient's feet, with flexion at the knees. This will create pooling of blood in the abdomen without pressure on the diaphragm.

EXCEPTION to shock position: head surgery and spinal anesthesia patients should remain horizontal unless otherwise ordered.

2. Keep airway clear.
3. Stay with the patient. Send for help. Do not leave the patient unless a competent person is present to stay with him until you return.
4. Be prepared to assist with IV and blood transfusion.
5. Be prepared to assist with oxygen therapy by mask or catheter. Start oxygen administration immediately at 6 liters per minute if cyanosis of lips, nailbeds, or earlobes is noticed.
6. Maintain close watch on urine output. Note amount and time of each voiding. If urinary catheter is used, note hourly output. To measure hourly output from a urinary catheter, tape a 30 ml. or 50 ml. Luer syringe barrel to the side rail of the bed. Attach drainage tube leading to a large collecting bottle to the tip of the syringe, and clamp this tube. Place the free end of the drainage tube leading from the catheter just within the open end of the syringe barrel. After reading and recording the urine measurement in the syringe barrel, release the clamp to allow the urine to enter the large collecting bottle. Reapply the clamp until the next scheduled interval for reading and recording urine output.
   a. An hourly output measurement is often ordered whenever there is a condition of oliguria (diminished urine secretion) or suspected anuria (absence of urine secretion).
   b. A critical point for effective kidney function is reached when systolic blood pressure drops below 80 mm. of mercury. Failure of the kidneys to form urine (renal shutdown) may result and continue after the blood pressure returns to normal. This may be a fatal complication. A general rule to observe in caring for all patients who have been in shock is: if after 2 hours of normal blood pressure, no urine or less than 25 ml. per hour is obtained, report this finding immediately to the doctor or nurse.
7. Maintain close watch as shock treatment measures are discontinued gradually when vital signs return to normal and become stable. One valuable test of return of circulatory control is the ability of the patient to maintain stable vital signs as his position is gradually changed from shock position to horizontal, to a slight elevation of his head. No sudden or abrupt movements are permitted.

HEMORRHAGE

a. General. Hemorrhage is bleeding from blood vessels due to a break in their walls. Realization of the possibility of delayed hemorrhage occurring either externally or internally as a postoperative complication is of utmost importance. During the operation, the surgeon controls the bleeding by pressure on oozing capillaries and very small vessels and by ligating (tying off) larger vessels. Reactionary (secondary) bleeding may occur within a few hours after the operation when circulation and blood pressure return to normal; owing to the depressing effect of the anesthetic on circulation, bleeding from capillaries may be very slight during the operation but increase considerably as the effect of the anesthesia wears off and the heart beat becomes stronger. This increased blood pressure may also cause bleeding by displacing blood clots previously formed or may even cause a ligature to slip from a large vessel. The patient may lose small amounts of blood over a relatively long period of time or a large amount (500 ml. or more) in a sudden massive hemorrhage.

b. Signs and Symptoms.

(1) Visible evidence of hemorrhage is noted by—

(*a*) Inspecting dressings.

(*b*) Inspecting the bedding under the patient.

(*c*) Noting presence of blood in vomitus, sputum, urine, feces, and drainage from tubing or catheter.

(*d*) Noting color change of drainage from the dark red or brownish color of old blood to the bright red of fresh blood.

(2) Evidence of internal bleeding is detected by keen observation. Be alert for symptoms of—

(*a*) Restlessness.

(*b*) Thirst.

(*c*) Apprehension.

(*d*) Increasing pulse rate.

(*e*) Falling blood pressure.

Treatment Measures for Hemorrhage

1. Notify nurse or doctor. Send for help. Stay with the patient unless competent help is present to relieve you while you obtain emergency equipment or other supplies.
2. Do not disturb or remove any part of the dressing. If external surface is blood-soaked, reinforce by placing large, dry, sterile compresses over it.
3. Save all evidences of bleeding for estimation of blood loss. This includes linen, emesis basin containing vomitus, and bedpan containing stool. Remove these from the bedside to lessen the patient's apprehension, but do not discard until so ordered.
4. Keep noise and confusion to a minimum.
5. Treat for shock.
6. Be prepared to assist with immediate transportation of the patient to the operating room.
7. Be prepared to assist with blood transfusion. Multiple units of blood (2500 ml. to 3500 ml. or more) may be necessary.
8. Be prepared to assist with blood plasma, dextran, or electrolyte solution infusion. The type, speed, and the sequence in which all IV fluid replacements are given are always determined by the doctor.
9. In hemorrhage from the gastrointestinal tract, be prepared to assist with gastric intubation if a tube is not already in place. Ice water irrigations of the gastrointestinal tube may be ordered or an enema to clear accumulated old blood from the rectum and lower bowel.

CIRCULATORY PROBLEMS

Thrombophlebitis

Thrombophlebitis is inflammation of a vein with blood clot formation. Venous stasis (slowing of venous blood circulation) and pressure or other injury to vein walls predisposes to its development. The most common sites for development of thrombophlebitis are in the veins of the pelvis and legs. A postoperative patient or any other individual who has remained still for hours at a time, with relaxed muscles and a resultant slowing of venous circulation in the legs, is particularly liable to develop thrombophlebitis; when inactivity is combined with pressure on the popliteal space and the calf of the leg, the possibility of developing it increases.

a. Signs and Symptoms of Thrombophlebitis.

(1) Cramping pain in the calf.

(2) Possible redness, warmth, and swelling along the course of the involved vein.

(3) Pain which may appear only on dorsiflexion of the foot.

b. Treatment Measures.

(1) Do not under any circumstance rub or massage the affected limb.

(2) Place the patient on immediate bed rest and notify the medical officer.

(3) Keep affected limb horizontal and at rest until the medical officer has examined the patient and ordered specific treatment. Support the entire limb from the thigh to the ankle on pillows, keeping the limb level unless otherwise ordered. Orders for treatment may include elevation and application of continuous, massive, warm, moist packs to the entire limb.

(4) Use a bed cradle to prevent any pressure from the bed linen.

(5) Be alert to any complaint or other evidence of respiratory difficulty or chest pain. A clot which is adherent to the vein wall, or a portion of a clot, can become dislodged and be carried in the circulation as an embolus to distant and smaller arterial blood vessels in the lungs. Sudden dyspnea, violent coughing, or severe chest pain may be the first sign or symptom of embolism.

(6) Discontinue routine postoperative exercise, ambulation, deep breathing, and coughing measures until the medical officer has indicated which measures are to be resumed and which precautions are taken.

(7) Carry out all subsequent treatment and nursing care measures so as to avoid abrupt movements and any strain on the part of the patient.

(8) When ordered, apply bandages to give support and aid venous circulation:

(*a*) Use a 3-inch or 4-inch cotton elastic bandage. Two or more are usually required for each extremity.

(*b*) Apply bandage with the patient supine and his foot supported in a neutral position (slight dorsiflexion).

(*c*) Start just proximal to the toes and apply smoothly and snugly, overlapping each turn evenly to avoid any constriction or pinching of skin from bandage edges. Include the heel. Wrap from toes to 1 inch below the bend of the knee, or include all of the thigh to the groin, according to orders.

(*d*) Remove bandages at least once daily to care for and inspect the skin. Wash and dry the involved area using gentle stroking motions, but no patting or rubbing motions. Report immediately any evidence of pressure, wrinkles or edema.

(*e*) Reapply clean, resilient bandages following skin care and inspection of all skin areas. Cotton elastic bandage loses its resilient quality in use, but it can be laundered and its resilience maintained for several reapplications. Send used bandages to the laundry, preferably in a mesh bag. Obtain fresh bandages from CMS. Do not use a bandage that is not resilient—it will bind and restrict circulation instead of aiding it.

(9) When patient is allowed out of bed, remind him to alternate walking and resting with feet propped on a stool to avoid pressure in the popliteal space. Prolonged standing or sitting with no movement must be avoided. Check to see that the edge of the chair seat does not press the popliteal space and that the patient does not sit with crossed legs.

Embolism

An embolus is a blood clot or other foreign particle (fat globule or air bubble) floating in the bloodstream. The embolus is usually undetectable until it suddenly lodges in an arterial blood vessel. This may occur when the patient is apparently convalescing and progressing normally. If the embolus is sufficiently large and the arterial vessel which it obstructs supplies a vital area in the lungs, heart, or brain, the patient may die before any symptoms of embolism are detectable. A special type of embolism, pulmonary embolism, is caused by the obstruction of a pulmonary artery by an embolus. The most frequent cause of a postoperative pulmonary embolism is a thrombosed vein in the pelvis or lower extremities. Therefore, measures to prevent development of thrombophlebitis are the most important ones to take to prevent the possibly fatal complication of pulmonary embolism.

a. Signs and Symptoms.

NOTE

May or may not be observable.

(1) Sudden signs of shock and collapse.

(2) Sudden, sharp, stabbing chest pain.

(3) Sudden violent coughing and hemoptysis (spitting of blood).

b. Treatment Measures.

(1) Call the doctor.

(2) Insure absolute bed rest. Elevate head of bed to relieve respiratory distress.

(3) Prepare to start oxygen by mask at 6 to 8 liters per minute.

(4) Take and record blood pressure, pulse, respiration.

(5) Prepare to give medication by injection to relieve pain and acute apprehension. A narcotic drug such as morphine sulfate or meperidine hydrochloride is often ordered; if ordered for IV injection, it is given by the doctor.

(6) Prepare to continue intensive nursing care and constant observation. (The total care of the patient who survives a pulmonary embolism is similar to that of a patient who has had a myocardial infarction.)

NOTE

Anticoagulant drug therapy in thrombophlebitis and embolism.

Anticoagulant drugs such as heparin sodium and coumarin compounds lessen the tendency of blood to clot. They are frequently ordered as a part of the medical management of patients who have developed thrombophlebitis or who have survived an embolism. These drugs do not dissolve thrombi which have already formed but are an important treatment measure to prevent extension of a clot within a blood vessel or to prevent further intravascular clot formation. Anticoagulant drugs act by prolonging the clotting time of blood. Since a patient who has once developed thrombophlebitis may have a recurrence, he may be continued on an anticoagulant drug indefinitely as a prophylactic measure. Nursing personnel have a responsibility to recognize that any patient receiving an anticoagulant drug must be observed closely for any bleeding from a body opening—mouth, nose, urinary tract, or rectum. Individual patients differ widely in their response to anticoagulant drugs and if bleeding occurs, the doctor must be notified at once and the drug discontinued. Drug dosage is regulated very carefully by the doctor in relation

to the individual patient's prothrombin determination, a laboratory test which requires obtaining a blood specimen by venipuncture. Certain drugs should not be given with anticoagulants. Aspirin and aspirin-like drugs increase the effect of the anticoagulant. Phenobarbital and phenylbutazone (butazolidine) decrease the effects of the anticoagulant. Because of the potential hazards of anticoagulant drug therapy and the complicated dosage orders to be followed, local policy often states that only the nurse may administer the drug. The medical specialist should know which patients are receiving an anticoagulant, be alert for any bleeding tendency, and report his observations immediately.

RESPIRATORY PROBLEMS

a. Prevention. When preventive measures have been carried out during the immediate and early postoperative periods, the possibility of atelectasis and of pneumonia developing are greatly reduced. Keeping the airway clear to prevent aspiration, deep breathing, coughing, turning and changing the patient's position q.2 h., and early ambulation are all basic measures to prevent respiratory complications. In addition to these routine postoperative measures, it is important to emphasize protecting the patient from contact with personnel, visitors, or other patients who may have an upper respiratory infection.

b. Special Preventive Treatment Measures. Patients with chronic respiratory diseases, elderly patients, children and infants, or brain damaged adults who cannot follow verbal instructions, and any patient whose movements are necessarily restricted because of the kind of surgery performed often need treatment measures in addition to routine preventive measures to help them to cough and clear their bronchi of secretions. Special treatment measures ordered may include—

(1) Steam inhalations or nebulized cool-vapor inhalations. Increased moisture in the inhaled air helps to liquify accumulated secretions and facilitates coughing them up to clear the air passages.

(2) Intermittent positive pressure breathing (IPPB) treatments with special apparatus to administer nebulized medications and moistening agents.

(3) Deep intratracheal suction to stimulate the cough reflex. This is suction by a nasal catheter which is passed down into the trachea to the bronchial area. A doctor or a nurse is responsible for this type of suctioning.

(4) Bronchoscopy, an operative procedure, to remove secretions which cannot be coughed up and which are blocking the air passages.

(5) Tracheostomy, an operative procedure, to insure an open airway which must be kept open by suctioning. A tracheostomy is sometimes performed during the initial surgery when the surgeon anticipates difficulty in maintaining a clear airway postoperatively.

c. Signs and Symptoms of Developing Respiratory Problems.

(1) Temperature elevation 24 to 48 hours postoperatively.

(2) Pain in chest.

(3) Cough.

(4) Dyspnea.

d. Treatment Measures for Respiratory Complications.

(1) Increased attention to all preventive measures.

(2) Antibiotic therapy.

(3) Isolation.

(4) Bed rest, or a combination of bed rest and ambulation.

(5) Oxygen and other forms of inhalation therapy.

GASTROINTESTINAL COMPLICATIONS

a. General. A certain amount of nausea and some initial vomiting may follow general anesthesia, but are not inevitable; many patients do not experience these once-anticipated discomforts. However, when they do occur and persist beyond the immediate anesthesia recovery period, treatment is started to combat their effects. Persistent nausea seriously reduces the possibility of the patient taking adequate fluid by mouth; excessive vomiting causes both dehydration and loss of electrolytes. Treatment orders may include parenteral medication to relieve nausea, IV fluids to replace electrolytes and relieve dehydration, and gastrointestinal intubation and suction to rest the gastrointestinal tract. Basic nursing measures which are helpful include maintaining a quiet, cool, odor-free environment; gentle handling and no abrupt position changes since motion tends to increase nausea; and reassurance.

NOTE

The young military patient often becomes nauseated from a prolonged period without eating. Food or fluid as

soon as permitted will generally relieve his symptoms immediately.

b. Failure of Peristalsis. Acute dilation of the stomach and paralytic ileus sometimes occur when there is an accumulation of gas and fluid which the stomach and small intestine are unable to pass along because of a failure of normal peristalsis. This complication may develop 2 to 4 days postoperatively and cause great discomfort or pain. Almost immediate relief is obtained by intubation (accomplished by the doctor) and suction for decompression of the dilated stomach and small intestine. The ability of the patient to expel flatus (gas) by rectum is an indication that normal peristalsis is being re-established.

c. Fluid Balance Problems. The major nursing responsibility in maintaining fluid balance and preventing fluid balance problems is a constant awareness of the necessity for maintaining an accurate intake-output record (para 5-46). Follow all medical orders for fluid and nutrition therapy. Be alert to the patient's acceptance of his prescribed diet. Report problems immediately.

5-110. Tracheostomy Nursing Care

Tracheostomy is a surgical procedure performed to provide an unobstructed airway. In the hospital setting it is usually done in the operating room, although in extreme emergency it may be done at the bedside. Following establishment of the airway, a tracheotomy cannula (tube) made of silver metal or of plastic material is inserted. Essential postoperative care always includes frequent and gentle aspiration of the tube and the trachea to keep them cleared of accumulating secretions.

a. Tracheal Cannula Set. The cannula set includes a 3-part tube set (fig. 5-84 Ⓐ and Ⓑ) and a tracheal dilator (fig. 5-84 Ⓒ), a type of retracting instrument.

(1) The outer tube has a slotted flange on either side, to which tapes are tied, and a small lug (lock).

(2) The inner tube fits into the outer one and is locked in place when the lock is moved to down position.

(3) The obturator is used by the surgeon as a guide when inserting the outer cannula into the tracheal incision.

(4) The dilator is used to hold the edges of the incision apart so that the outer tube can be inserted.

(5) In routine care of the tracheotomy tube, the inner tube is removed by nursing personnel for cleansing; the outer tube is removed only by the physician. Care must be taken not to damage or drop any part—if bent or dented, it will not fit properly and the parts of one set are not interchangeable with parts of another.

(6) The obturator of the set in use and a dilator for emergency use must always be kept, clearly marked, at the patient's bedside; both should accompany the patient when he is transported away from his bed unit.

b. Preparatory Nursing Measures. In addition to routine preparation of the patient unit for postoperative care, the following measures for tracheostomy care require advance planning:

(1) *Constant attendance.* The patient will require constant attendance for at least the first 48 hours. The medical specialist must always remember two things: that the patient's life depends upon a clear airway and that the tracheotomized patient will have a temporary loss of voice. Place a pencil and paper on the bedside table so he will know that a means of communication has been provided for him. Leave a tap bell always within his reach; the sound of the bell attracts attention as a substitute voice and is usually more reassuring to the patient than dependence on a signal light.

(2) *Provision of warmth and humidity.* For the first few postoperative days and for longer periods when required, keep the patient in a room where the temperature can be maintained at about 80 degress F. (warmer than usual ward temperature). Use a steam vaporizer or other humidifying apparatus constantly to moisten the air. These two measures help to reduce the tracheal irritation that results when inspired air has bypassed the natural warming and humidifying nasopharyngeal passages.

(3) *Preparation of patient unit for postoperative care.* The equipment listed below should be available at the bedside. Because of the number of items required, it is advisable to provide a mobile table or an additional bedside cabinet within the unit.

EQUIPMENT

Suction and pressure apparatus (mobile, portable, or wall unit)
Y-tube connector, for catheter
Sterile suction catheters (size 14 or 16 for adult)

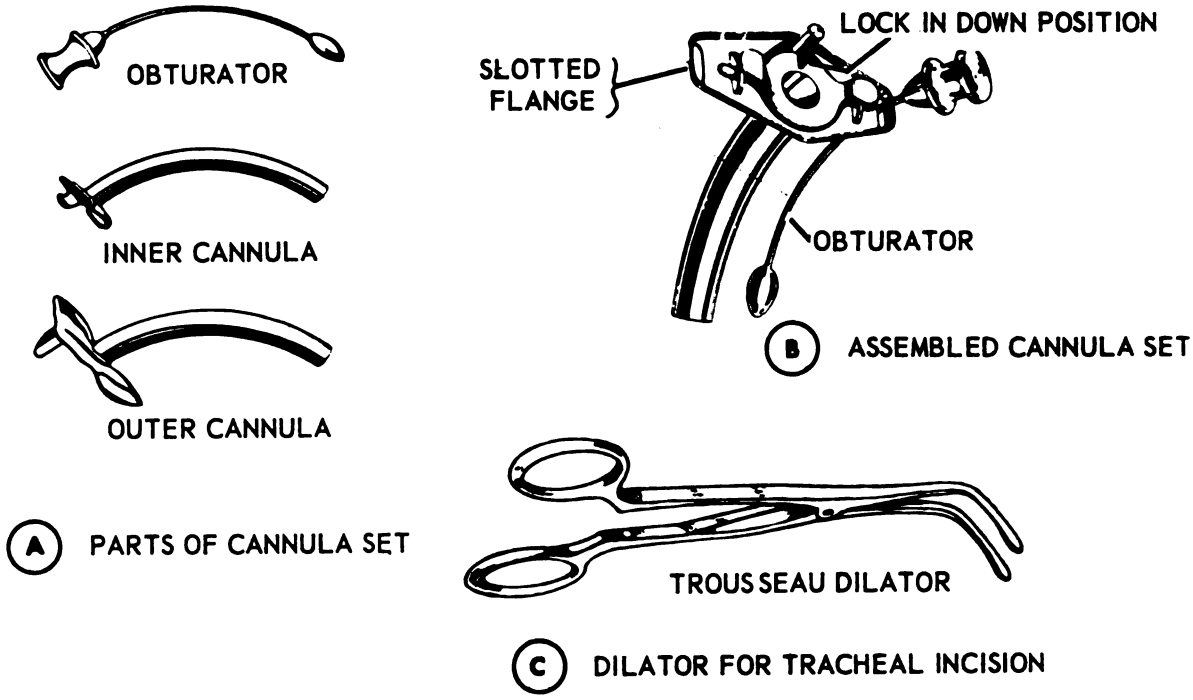


Figure 5-84. Component parts of tracheal cannula set.

Tracheotomy dilator, sterile (Trousseau dilator or Kelly forceps)
Tracheotomy cannula set (duplicate of set in use)
Sterile gloves (plastic, disposable), package
Sterile medicine glass and medicine dropper (or sterile 2 ml. syringe)
Sterile saline, flask
Sterile dressing set: scissors, thumb and Kelly forceps, gauze, 4 x 4 inch or other approved dressings
Sterile gauze, 2 x 2 inch, package
Sterile towels, package
Sterile water, flask
Oxygen supply with humidifier
Steam vaporizer or jet vapor humidifier
Cotton twill tape, roll
Bandage scissors
Basin, emesis
Hydrogen peroxide (or commercial surgical cleaner such as Hemosol)
Pipe cleaners or test tube brush
Pencil and paper
Tap bell
Adhesive tape, roll
Transfer forceps in container
Foil-wrapped germicide wipes (for hand cleansing)

CARE OF THE TRACHEOTOMY

Precautions

1. *Aseptic technique.* Apply basic principles of aseptic technique in caring for the incision and the airway. The tracheotomy wound is easily infected and tracheobronchitis and other respiratory tract infections such as bronchopneumonia can result from poor technique. Although strict surgical asepsis is difficult to maintain because of the nature of the wound and the secretions which are present, the following measures are important:

a. Use separate catheters for nasopharyngeal and tracheotomy suctioning.

b. Use separate flasks of sterile water for clearing the separate catheters. Clearly mark each flask "Nasal Catheter" and "Tracheal Catheter."

c. When possible, replace the used tracheal catheter with a sterile one for each aspiration. When this is not possible, clear the used tracheal catheter in water and place between sterile towel folds. The medical officer may recommend that the catheter be kept immersed in a mild, aqueous, germicide solution such as benzalkonium chloride (Zephiran) of a prescribed dilution.

d. Wear a new plastic, disposable glove on the hand used for manipulating the tracheal catheter. Discard the glove after each use. This measure is particularly

helpful when handwashing at the bedside is not possible.

e. Keep the dressing clean and dry. NOTE: Initially, there may be two dressings. One is a gauze or surgical plastic-film dressing on the sutured incision area above the cannula; this dressing is changed only by the medical officer and is omitted when the sutured area heals. A second, the "tube dressing," should be changed as often as it becomes soiled by the secretions.

2. *Special observations.* Observe the patient constantly for such signs of respiratory obstruction as a bubbling sound during respiration, restlessness, cyanosis, or an increase in the pulse rate. In addition to these observations, watch for bleeding from the incision and in the aspirated secretions; for coughing; or for choking when swallowing saliva or oral fluids. (There may be some damage to the esophagus, with leakage of swallowed secretions into the trachea.) Any of the above signs must be reported immediately. Use care when shaving a male patient to prevent any hair from being aspirated—protect the tube opening with a moistened gauze square that will trap any small hairs but not obstruct the airway.

3. *Position and position changes.* Usually the patient is comfortable in a semirecumbent position. Assist and encourage him to change his position frequently and to turn from side to side at least q. 2 h. to promote aeration of the lungs and to aid drainage of secretions.

4. *Suctioning the tracheotomy tube.*

a. Be gentle. Forceful introduction of the catheter and too strong suction pressure will damage the mucous membrane.

b. Suction as often as needed to keep the tube clear. This may be every 5 to 10 minutes during the first few hours postoperatively.

c. Limit each aspiration to about 5 seconds. The presence of the catheter in the tube reduces the airway.

d. Flush the catheter before and after each aspiration. Check to see that the sterile water passes completely through the tubing to the suction bottle. Do not allow the bottle to become overly full.

Suctioning Technique

1. Test suction. Turn on suction apparatus and place tip of the catheter in the flask of sterile water labeled "Tracheal Catheter." Use the gloved hand to handle the catheter and the ungloved hand for other manipulations.

CAUTION

Check pressure gauge on apparatus and do not exceed prescribed pressure. As a general rule, the range for an adult will be 7 to 15 inches if gauge is calibrated in inches or 120 to 150 mm. if gage is calibrated in millimeters.

2. Wipe secretions from tube opening with sterile gauze.
3. With Y-valve open, insert the catheter about 5 inches into the tracheotomy tube.
4. Apply suction by placing finger over the free arm of the Y-valve (fig. 5–85) while gently rotating and withdrawing the catheter. If the catheter "grabs," remove the finger from the Y-valve.

CAUTION

Do not push the catheter up and down. Do not pinch the tubing.

5. Flush the catheter on withdrawal.
6. Wipe secretions around tube opening after suctioning is completed.

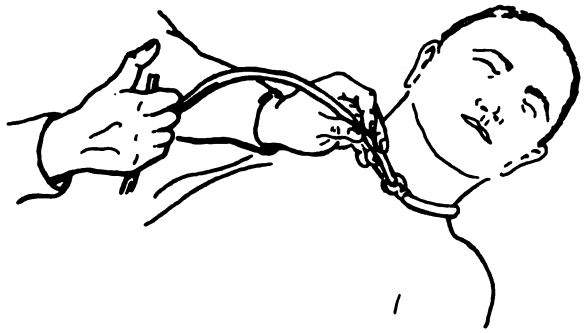
Care of Tracheotomy Inner Tube

The outer tube is removed and changed only by the physician. The inner tube is removed and cleaned by the medical specialist as often as necessary until the secretions subside; then it is cleaned at least twice daily.

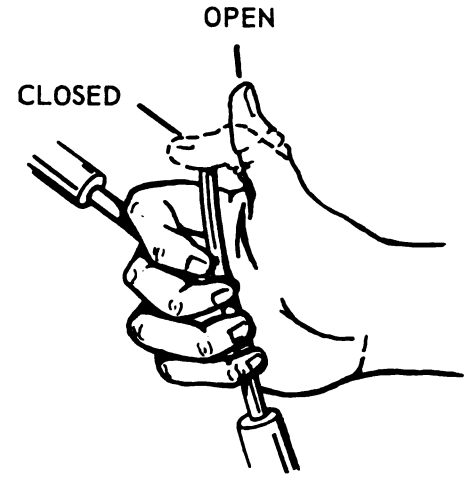
1. Release inner tube by holding outer tube in place with index finger of one hand while turning lock at the top of the outer tube with the other hand.
2. Hold outer tube in place and remove inner tube, using outward and downward movement in conformity with the curve. Handle the inner tube carefully to prevent any dents.
3. Place inner tube in basin containing cleaner solution. (If hydrogen peroxide is used, use half and half with water; if a surgical cleaner is used, follow directions on container.)
4. Soak for a few minutes to loosen mucus and other adherent secretions.
5. Using pipe cleaners or the test tube brush, cleanse the inner tube of the loosened secretions. Repeat mechanical cleaning until the tube is clean.

NOTE

Never use cotton-tipped applicators —the tip can be dislodged and ob-



ASPIRATION OF TRACHEOSTOMY TUBE WITH CATHETER ATTACHED TO A Y-TUBE



Y-TUBE IS USED TO CONTROL SUCTION

Figure 5-85. Y-valve suction technique.

struct the tube; gauze squares that ravel may leave a thread or particle of gauze within the tube and are also potentially hazardous; a nonraveling gauze bandage strip may be used if pipe cleaners or test tube brush are not available.

6. Rinse the cleaned tube by pouring sterile water through and over it. (An accepted alternate: rinse the tube under a sink faucet, using cool running water.) Drain and dry with a sterile towel.
7. When so ordered, sanitize inner tube by boiling for 10 minutes, using a small instrument sanitizer—not the utensil sanitizer.
8. Aspirate the outer tube before replacing the inner tube.
9. Lock the replaced inner tube in position.

Assisting With Change of Outer Tube

1. Assist the medical officer as needed.
2. At the bedside, have the dilator (or Kelly forceps) available for holding open the incision into the trachea if necessary; the replacement tube set with tapes attached. (Tapes are customarily placed on the tube in CMS before the set is autoclaved.)
3. When the new tube set has been inserted by the doctor, tape the new obturator to the head of the bed.
4. Return the previously used set, complete with its obturator, to CMS.

To Change the Tube Dressing

1. Use aseptic technique.
2. Change the dressing as often as necessary. (The initial dressing is usually done by the medical officer.)
3. Support the outer tube shield while removing the gauze dressing to avoid displacement of the tube. If the dressing is stuck to the skin, moisten it with sterile saline before removing it.
4. Cleanse the skin around the tube, using prescribed skin cleansing solution or sterile saline. Report any signs of inflammation and any evidence of leakage of oral fluids or foods about the tube opening.
5. Cut a slit in a 4- x 4-inch gauze square or a nonadherent absorbent strip, halfway through. Be sure to put tape over the cut edges of the gauze to prevent a small piece of thread from entering the air passage.

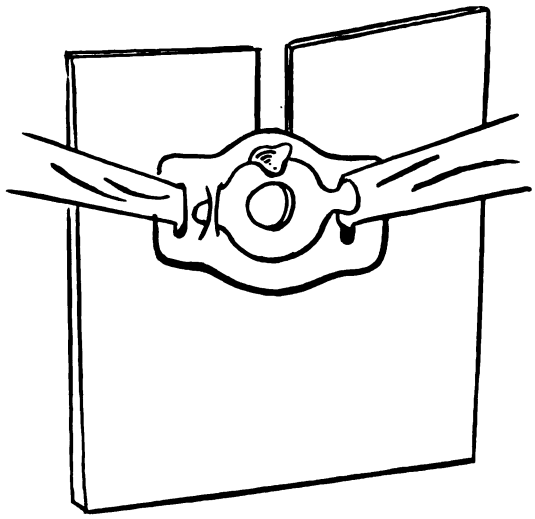


Figure 5-86. Tube dressing.

6. Using forceps, pull the slit dressing gently under the outer tube shield. Place the slit toward the chin. The uncut portion is below the tube to absorb secretions (fig. 5-86).
7. Check to make sure the dressing is secured underneath the shield. It must not slip out or occlude the airway. A strip of adhesive may be used on the upper edges to hold it in place p.r.n.
8. Check outer tube tape straps and replace them if soiled. While changing straps, ask the patient or an assistant to hold the outer tube in place until the straps are retied, as a cough could dislodge the unsecured outer tube. To replace tape ties—
   a. Cut two 16-inch lengths of tape, using bandage scissors.
   b. Cut a horizontal slit about 1 inch from one end of each tape.
   c. Thread the slit end through side opening of the outer tube and draw the opposite end through the slit.
   d. Tie tapes in a square knot at the side of the neck. Check to insure that they are tight enough to retain the tube but with no pressure.

Providing Humidity for the Tracheotomized Patient

Use one or more of the following measures, as prescribed by the medical officer, to moisten, warm, and filter the inhaled air. Mucus dries and forms plugs when the respiratory tract becomes dry; this dried mucus is hazardous and must be prevented from forming.

1. Place a 4- x 8-inch plain gauze compress to form a bib over a strip of tape, which is then tied around the patient's neck. Be sure to tie the bib tape in a bow on the side of the neck opposite to the square knot tape tie which secures the outer tube. Keep this bib, moistened with saline, over the tube opening.
2. Using a 2 ml. syringe or medicine dropper, instill 3 or 4 drops of sterile saline into the tracheotomy tube before suctioning. This instillation helps thin secretions for easier aspiration.
3. Administer nebulized mist, directed into the tracheotomy tube, by a nebulizer unit under air or oxygen pressure. A special apparatus is used for this treatment, so local instructions for its operation should be followed.
4. Use a steam vaporizer, directing the tube outlet upward toward the tracheotomy tube. Keep the patient from becoming damp or chilled from the steam, as chilling is conducive to respiratory infection. Protect the patient from drafts. Keep the windows and door in the room closed in order to help concentrate moisture from the steam.

Providing Oxygen Therapy

There are several methods of introducing oxygen into the tracheotomy tube. Four of these methods are listed below.

NOTE

Whatever method is used the oxygen must be humidified, since oxygen is drying and will cause irritation. Administer at the rate prescribed by the doctor.

1. Use a commercial tracheotomy-oxygen device when it is available. This is a transparent plastic mask which fits over the tube.
2. Attach a small funnel to the oxygen tubing and place the funnel over the tube.
3. Use a bent-needle technique. Clip off the sharp bevel end of a 15-gage IV needle and bend the needle about halfway along the shaft. Attach the needle hub to the oxygen tubing. Insert the distal end of the needle into the tracheotomy tube, anchoring it with adhesive (fig. 5-87 Ⓐ).
4. Insert an oxygen nasal catheter about 1 inch into the tracheotomy tube, anchoring it with adhesive (fig. 5-87 Ⓑ). The catheter tends to obstruct the tube, and this method is, therefore, the least desirable of the methods to be used.

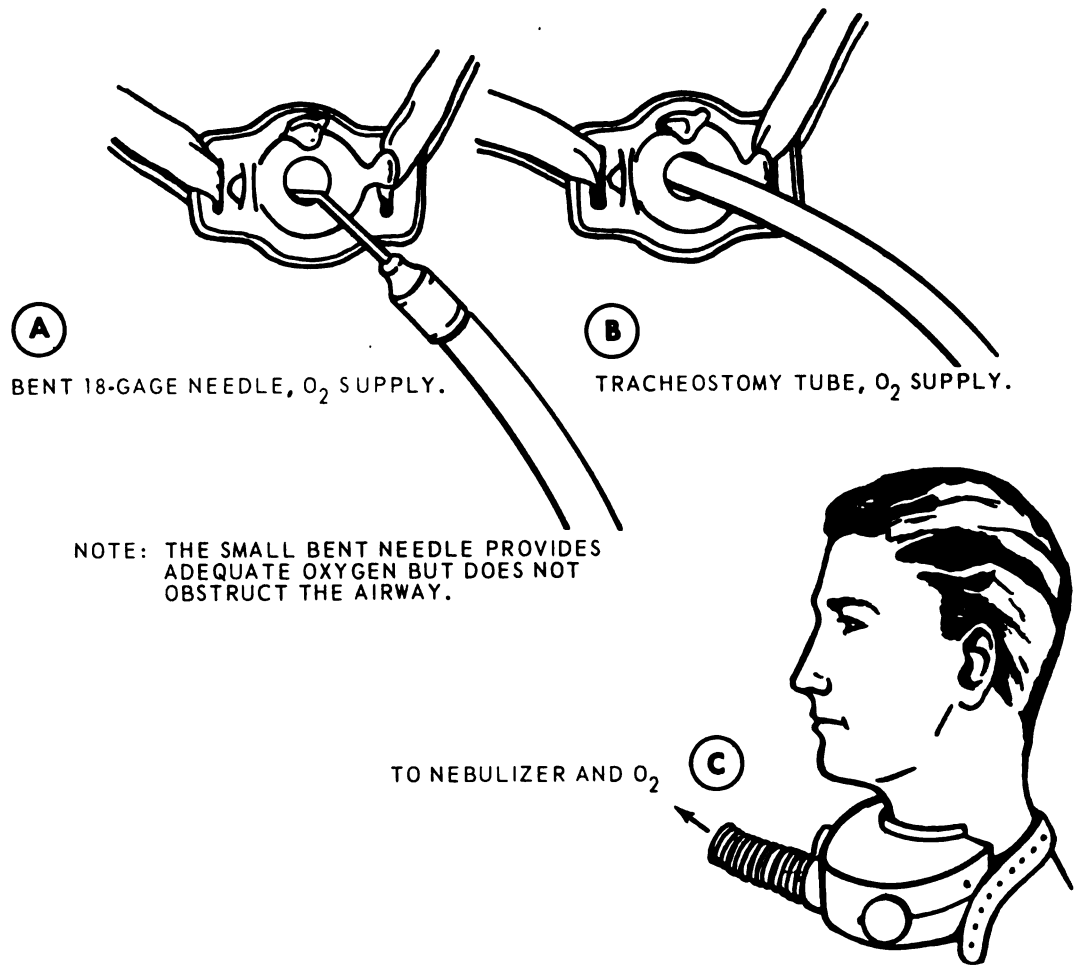

A
BENT 18-GAGE NEEDLE, O_2 SUPPLY.
B
TRACHEOSTOMY TUBE, O_2 SUPPLY.
NOTE: THE SMALL BENT NEEDLE PROVIDES ADEQUATE OXYGEN BUT DOES NOT OBSTRUCT THE AIRWAY.
TO NEBULIZER AND O_2
C

Figure 5–87. Tracheotomy tube, administration of oxygen.

Assisting With Decannulation of Tracheotomy Tube

Decannulation (extubation) refers to the gradual elimination of the tube opening to permit the patient to return to normal breathing through his nasopharyngeal passage. The doctor orders the type of tube obstruction to be used and the interval and length of time it is to be left in place. Small corks or rubber stoppers, with wedge-cuts of varying sizes, are usually used. Following removal of the tube, the skin edges are approximated to permit healing of the incision. During the decannulation process—

1. Continue close observation for any signs of respiratory distress.
2. Be particularly observant of tolerance of the closure when the patient is asleep. Before the tube is removed, the patient should be able to breathe normally, with tube completely closed off, day and night.

5–111. Thoracentesis

Thoracentesis (chest tap) is the surgical puncture of the chest wall, to withdraw fluid or air from the pleural cavity for diagnostic and therapeutic purposes. A thoracotomy needle is inserted by the doctor through the intercostal (between ribs) area into the pleural cavity. Suction is then applied by syringe to aspirate the accumulated fluid or air. The procedure is usually done at the patient's bedside.

EQUIPMENT

Thoracentesis tray, sterile, from CMS
Drainage bottle, calibrated from CMS
Gloves, sterile
Compresses, 4- by 4-inch, sterile
Skin germicide, as prescribed
Local anesthetic, as prescribed
Emergency drug stimulant tray
Alcohol sponge container
Transfer forceps

Emesis basin
Tape, adhesive
Specimen labels
Water glass, empty (for specimen tubes)
Mobile table or Mayo stand

PREPARATION FOR THE PROCEDURE

1. Check Clinical Record for signed SF 522 (Authorization for Administration of Anesthesia and for Performance of Operations and Other Procedures).
2. Prepare the patient and reassure him with appropriate explanations. Assure him that the doctor and you, as assistant, will help him to maintain the required position and to avoid moving and coughing during the procedure.
3. Take and record TPR and BP.
4. Screen the patient. Remove pajama jacket to expose chest. The site of the puncture will depend upon the location of the fluid or air which is to be aspirated.
5. Position the patient as directed by the medical officer. The position may be either one of the following:
   a. Seated on the side of the bed facing away from the operator, with feet supported on a chair and the head and arms resting on an overbed table padded with pillows. The arms are elevated slightly to widen the intercostal spaces.
   b. Place in a semirecumbent position, facing away from the operator, resting on the nonaffected side, with the head of the bed elevated about 45 degrees. A pillow is placed under the chest to widen the intercostal spaces. The arm of the affected side is placed above the head to elevate the ribs, thereby making the insertion of the needle easier.

ASSISTING WITH THORACENTESIS PROCEDURE

1. Place thoracentesis tray on instrument table. Open sterile wrapper cover to provide a sterile field.
2. Place other supplies on adjacent bedside stand or overbed table. Open glove wrapper.
3. Pour germicide solution as required—this may be over a gauze sponge the doctor holds over the emesis basin, or into a sterile container on the tray.
4. Assist with handling of local anesthetic vial. Hold vial with label uppermost so that the medical officer can personally check the label before withdrawing any of the solution. Cleanse stopper with alcohol sponge. Invert vial and hold firmly while the doctor with gloved hands withdraws the required solution.
5. Assist as directed with securing sterile drapes.
6. As instructed by the doctor, support and help patient to avoid moving and coughing while the thoracentesis needle is introduced.
7. Assist as directed with collection of specimens as the doctor manipulates the syringe, the stop cock, and drainage tubing. Use transfer forceps in removing specimen tubes from sterile field. Use care not to contaminate the end of the tubing, the cap, and open end of the specimen tubes. Cap the tubes and place them upright in a clean glass provided for this purpose. Label each tube as directed by the doctor.
8. If drainage of a large amount of accumulated fluid is necessary, assist the doctor by placing the free end of the tubing in the drainage bottle.
9. Watch the patient's color; check pulse and respiration. Report any sudden change stat. as this may indicate damage to the visceral pleura from a nick or puncture by the needle.
10. Assist with application of dressing.
11. Position patient comfortably (usually Fowler's position).
12. Remove equipment from bedside to utility room. Return emergency tray to proper place.
13. Complete entries on appropriate laboratory request forms (SF 514–M, Miscellaneous) as directed.
14. Send properly labeled specimens with completed request forms to laboratory immediately.
15. Measure and record amount of fluid withdrawn and discard this fluid in hopper or utility room unless directed otherwise.
16. Care for equipment properly—discard disposables, place all linen in hamper, and return appropriate items to CMS.
17. Continue to observe patient for respiratory difficulty: any blood in sputum, persistent cough, or dyspnea. Take and record vital signs q. 4 h., or as ordered.
18. Enter this information on Nursing Notes: date and time, procedure, by whom performed, amount and type of fluid withdrawn, patient's reactions, and specimens sent to laboratory.

5-112. Underwater-Seal Chest Drainage

Underwater-seal chest drainage is a closed (airtight) system for drainage of air and fluid from the chest cavity. It is a postoperative treatment measure following chest surgery and may also be used as an essential part of the initial medical management, under field medical conditions, of a patient with an open chest wound (if the problem of immediate transportation for evacuation is not involved). The care and observation of the underwater-seal drainage apparatus is an important nursing responsibility in addition to all other patient care measures during the immediate and early phases of postoperative care.

a. Explanation of the Procedure. The underwater-seal system is established by connecting a catheter which has been placed in the patient's pleural cavity to drainage tubing which drains underwater in a sealed drainage bottle. As the patient exhales, air and fluid in the pleural cavity are pushed through the catheter and drainage tubing. By keeping the end of the drainage tubing under water, air is prevented from re-entering the tube; by keeping the drainage bottle at floor level, fluid is prevented from siphoning back. As air and fluid are drained and prevented from re-entering the pleural cavity pressure on the lungs is relieved, and re-expansion of a collapsed lung is facilitated.

CAUTION

The catheter is clamped off by the medical officer at the time of its initial placement, and the catheter remains clamped until—

(1) The water-seal setup has been checked by the medical officer.

(2) The chest catheter connection to the drainage tubing has been checked by the medical officer.

(3) All connections are determined to be airtight.

b. Water-Seal Methods Used. The surgeon will specify the drainage setup he prefers to use. It is advisable to have CMS personnel obtain the required component parts, preassemble them to insure precise fitting, and process them to insure sterility. This type of preparation minimizes handling at point of use and promotes maintenance of asepsis.

(1) *Drainage without suction (1-bottle method).* Drainage without suction assistance is usually accomplished by means of a single underwater-seal bottle setup (fig. 5-88 Ⓐ). With this setup, the tube leading to the patient's catheter is connected to the long glass tube. The end of the long glass tube is submerged for a measured distance under sterile water. The long glass tube is the waterseal. The short glass tube is the air vent, through which air escapes to the atmosphere.

(2) *Drainage without suction (2-bottle method).* Drainage without suction using a 2-bottle method is illustrated in fig. 5-88 Ⓑ. This setup is used to prevent chest fluid from draining into the underwater-seal bottle. An airtight seal between the two bottles allows fluid to accumulate in the trap bottle (bottle 1) while air passes into the water-seal bottle (bottle 2) and escapes through the air vent. There is less hazard of possible ascending bacterial infection when the tubing leading to the patient's chest is not directly connected to the underwater seal. However, there are increased hazards from loose or improperly made connections to the water seal; this could lead to collapse of the lung.

(3) *Drainage with suction assistance (thermotic pump).* Drainage with suction assistance is used when water-seal drainage alone does not eliminate free air from the pleural cavity in sufficient quantities to permit lung expansion. Suction is usually provided by means of the thermotic pump (GOMCO, fig. 5-89) or an Emerson postoperative pump (fig. 5-90). This is a nonstandard item that is, however, used extensively in AMEDD hospitals. The thermotic thoracic pump is designed to provide automatic suction at a predetermined suction pressure. The doctor determines the amount of suction to be used by: (a) adjusting the water level in the manometer (bubble tube), and (b) by ordering the apparatus switch set on high or low. (Refer to the manufacturer's instruction manual and the local procedure manual for operating instructions.)

5-113. Underwater-Seal Drainage (One-Bottle Method)

(fig. 5-88 Ⓐ)

The underwater-seal drainage system using the one-bottle method is the system most commonly used when suction assistance is not required. The component parts, assembled in accordance with the instructions of the medical officer, are obtained from CMS. All adjustments and connection made at the bedside are made by the medical officer or are made by the nurse or medical specialist under the direction and supervision of the

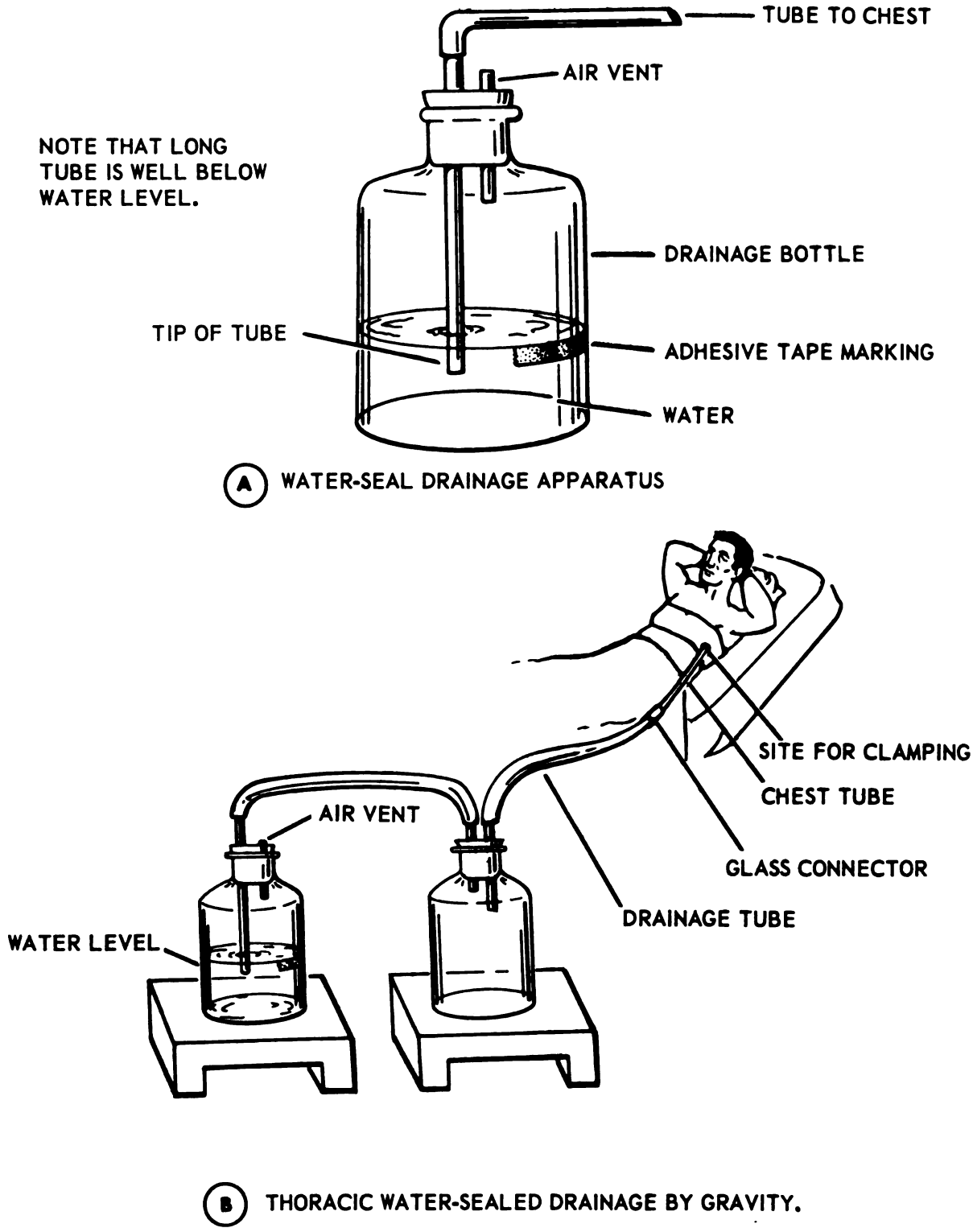


Figure 5–88. Water-seal chest drainage without suction.

medical officer. Aseptic technique must be maintained in preparing and handling the equipment.

EQUIPMENT

Drainage bottle set, sterile
Drainage tubing, with connector, sterile
Clamps, Kelly, rubber-shod, 2
Adhesive tape, 3-inch roll
Drainage bottle floor holder
Flask of sterile water
Pencil or marking pen
Safety pins

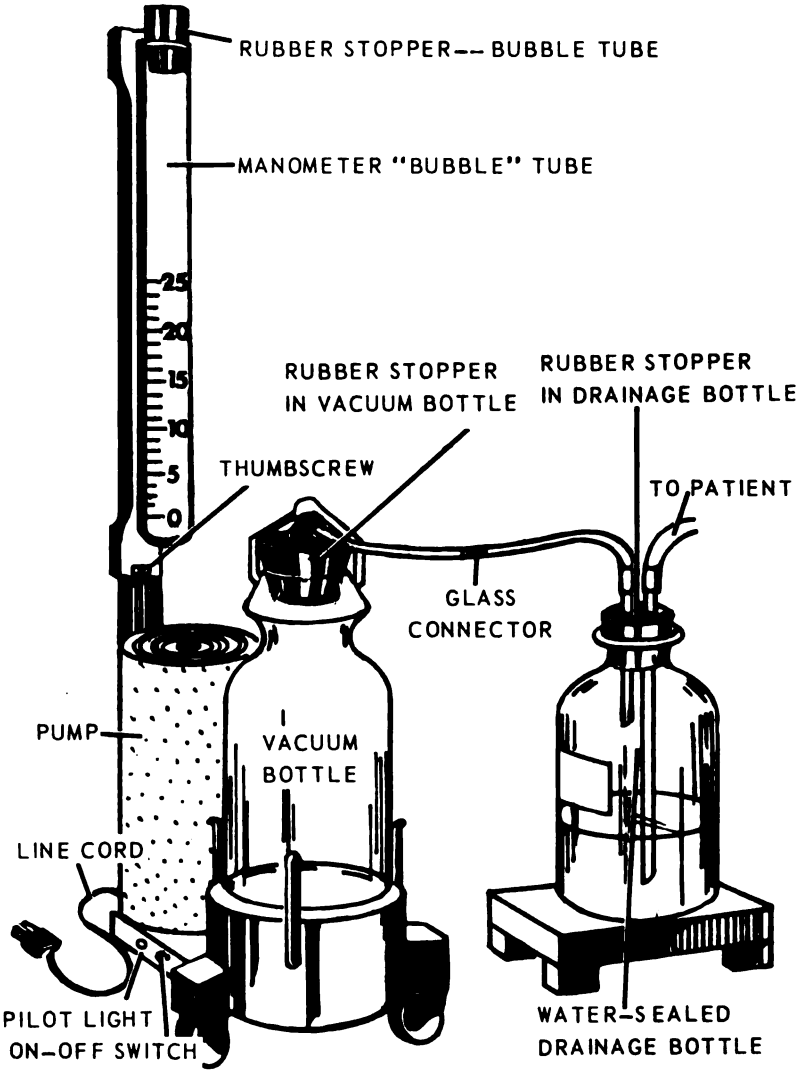


Figure 5-89. Water-seal drainage (GOMCO suction pump).

Preparation of Equipment at the Bedside

1. Make sure the long glass tube extends into the water to the depth specified by the medical officer. The initial depth is usually 2 ml. (approximately one inch), or just far enough for the end to remain submerged when water fluctuates in the glass tube as the patient breathes or coughs. The farther the tube extends into the water, the greater the intrapleural pressure must be to expel air and fluid into the drainage bottle.

NOTE

When received from CMS, the set is usually preassembled, with the stopper inserted and covered by a sterile paper cap. If sterile water has been already placed in the bottle, the amount in ml. or cc. should be indicated on the bottle so that the total amount of subsequent fluid drainage can be measured.

2. Tape the stopper securely to the neck of the bottle.
3. Place a strip of tape vertically on the bottle, from bottom to top. With pencil, mark on the tape the original fluid level in the bottle. Subsequent readings at the periodic intervals ordered by the doctor will also be marked on this tape strip.
4. Print "DO NOT LIFT" on a second strip of tape and stick this on the shoulder of the bottle so that it is visible from above.
5. Fold a strip of 3-inch adhesive to make a tab. Stick this tab on the head of the bedframe and secure the rubber-shod Kelly clamps to the tab

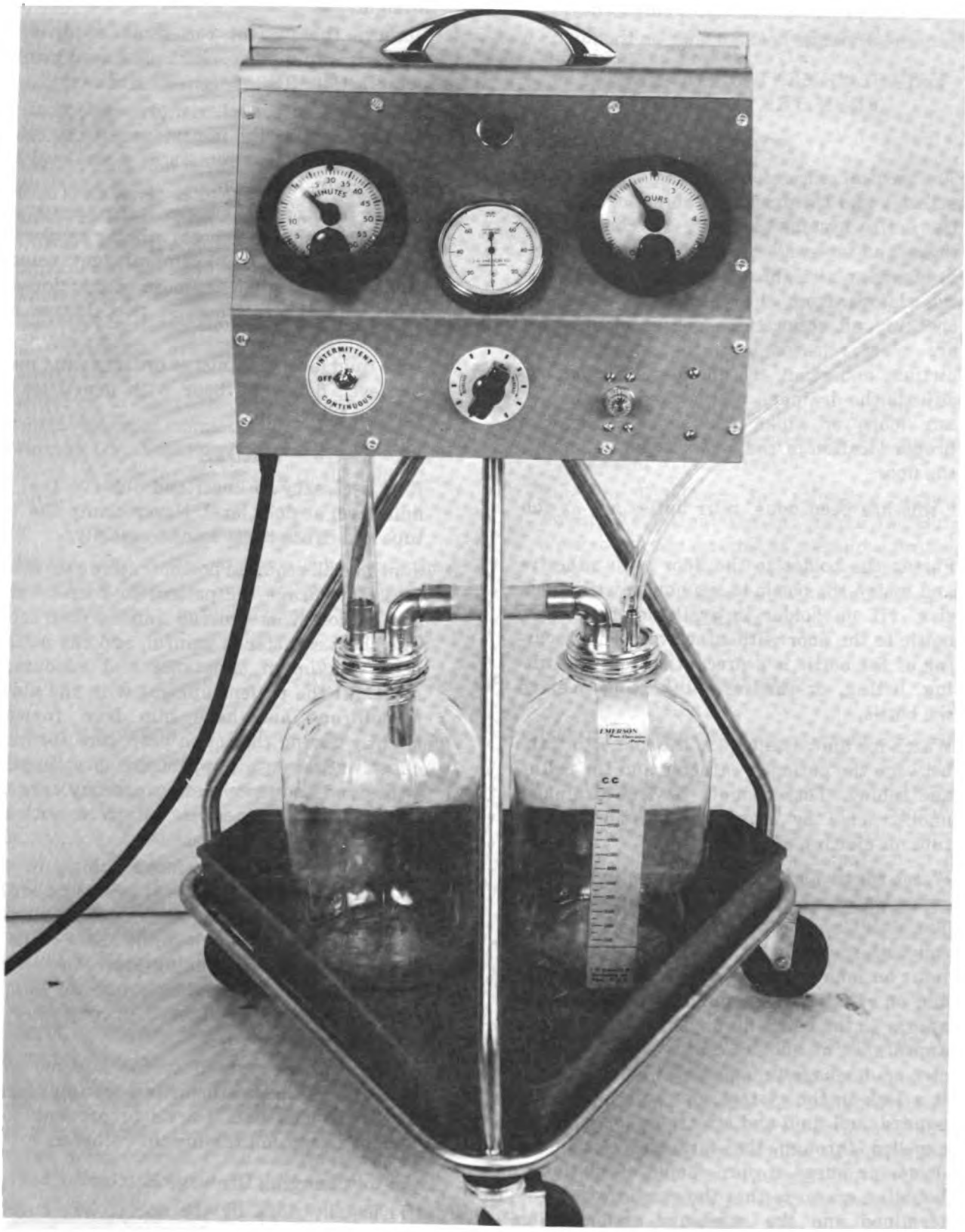


Figure 5–90. Emerson postoperative pump.

for immediate availability in clamping the patient's chest catheter in case of emergency.

6. Place the drainage bottle holder on the floor.

ESTABLISHMENT OF DRAINAGE FROM THE PATIENT

NOTE

The medical officer connects the patient's catheter and the drainage tubing, checks the entire system to verify all connections, and tapes all catheter connections to insure an airtight system. He removes the clamps from the chest tube after checking all connections. These clamps are never released until the system is airtight and ready to function. Then he adjusts the drainage tubing to eliminate any loops or kinks and specifies the proper location of the drainage bottle on the floor.

After this has been done, your duties are as follows:

1. Fasten the holder to the floor with adhesive and fasten the bottle to the holder with adhesive. (If no holder is available, fasten the bottle to the floor with adhesive.) This securing of the bottle is a precaution to avoid tilting, lifting, or inadvertent kicking over of the bottle.
2. Watch for fluid drainage in the connector tube between the patient's catheter and the drainage tubing. There should be free drainage, unobstructed by kinks, compression of the tube, or clotting of the fluid.
3. Watch for oscillation (fluctuation) in the long, glass, water-seal tube in the drainage bottle. The fluid level in this tube should rise and fall with the patient's inhalation and exhalation; on inhalation the fluid rises in the tube and on exhalation the fluid falls, and bubbles appear in the bottle fluid. This oscillation and appearance of bubbles ceases when the catheter or drainage tube becomes blocked; there is a leak in the system; or the lung has expanded, and fluid and air are no longer being expelled through the catheter. Notify the doctor or nurse at once should oscillation or bubbling cease, so that the reason can be determined and the necessary action taken. Permissible action for you to take without further instruction from the nurse or doctor is to check to see that the catheter or drainage tubing is not kinked or pinched off in any way and that all connections are apparently airtight.
4. Observe the patient for signs of dyspnea, cyanosis, rapid pulse, chest pain, and profuse perspiration. Report signs immediately.
5. Instruct all personnel, visitors, and other patients regarding the importance of the drainage bottle. It must remain at floor level and in its original location.
6. If any part of the system is impaired, immediately clamp the chest catheter as close to the chest wall as possible. Impairment includes such things as air leak, loose connection and raised drainage bottle. Use two clamps, one distal to the other.
7. Take fluid level readings as ordered, and mark the level, date, and hour with pencil on the vertical tape strip.

NOTE

It is necessary to kneel and observe the fluid level at floor level. Never clamp the tube and lift the bottle unnecessarily.

8. Continue all required postoperative care measures. Encourage the patient to deep-breathe and to cough as ordered and as instructed. The chest catheter is painful, and the patient needs maximum assistance and encouragement. Sit the patient upright with the aid of a pull-rope and have him lean forward slightly during the cough procedure for more effective drainage. Support the chest incision with hand and towel pressure, using care not to compress or otherwise interfere with the catheter.
9. Check fastening of drainage tubing to the foundation bedsheet to avoid loops and kinks. Support the tubing by pinching up and pinning a bridge or trough in the sheet, with no compression on the tubing from the safety pin. Be sure that the glass connector is visible at all times to observe gravity flow of drainage.
10. In turning the patient to the affected side, support the chest catheter in a trough formed by two folded bath towels to prevent body weight from compressing the catheter.

Changing Drainage Bottles

This is usually done by the doctor but may be done by the medical specialist when so ordered by the doctor.

1. Clamp the chest tube, using 2 clamps, before disconnecting any of the drainage apparatus.

2. Have a sterile bottle set up in readiness for immediate exchange.
3. Maintain sterility of connections.
4. Disconnect drainage tubing from the long glass insert in the used-bottle stopper.
5. Reconnect drainage tubing to the long glass insert in new bottle stopper.
6. Tape connection to insure airtight seal.
7. Check water level to insure that end of glass tube is submerged the required distance. Check to see that measured amount of water is recorded on the tape strip.
8. Tape stopper to bottle neck.
9. Release chest catheter clamps after insuring all connections are airtight. Secure clamps to head of bed.
10. Observe drainage in glass connector from chest catheter immediately after releasing clamps. It should be re-established without delay. Watch for fluctuation in the long glass tube.

Care of Used Equipment

1. Measure and record amount, color, and time interval of drainage. Subtract measured water from total to obtain fluid drainage total.
2. Remove all tape from the used-bottle stopper, glass tubing, and bottle surface. Use acetone or ether to remove sticky residue. Handle carefully to avoid breakage. Do not attempt to remove glass inserts from the bottle stopper.
3. Rinse bottle, stopper, and glass inserts in cold running water. Return all parts to CMS, protecting glass inserts by wrapping in towels to prevent breakage.

Recording

1. Enter in the Clinical Record, on DD Form 640, (Nursing Notes), the following information:
   a. Date and time of change of drainage bottle.
   b. Amount, color, and type of fluid (for example: sero-sanguinous (pinkish or light red), dark red, yellowish).
   c. Person who changed drainage bottle.
   d. Statement as to whether or not specimen was sent to laboratory.
2. Enter on DD Form 792 (Nursing Service—Twenty-Four Hour Patient Intake and Output Worksheet) the amount of measured drainage. This amount is the difference between the initial measured water and the amount in the bottle when the bottle is replaced.

Section XI. NURSING CARE OF THE ORTHOPEDIC PATIENT

5-114. Introduction

Orthopedics is the medical specialty that includes the investigation, preservation, restoration, and development of the form and function of the limbs, spine, and associated structures by medical, surgical, and physical means. The basis of orthopedic nursing is understanding and applying the principles of body mechanics (sec. III). While the application of these principles is a basic requirement in all nursing care, additional emphasis is needed when working with orthopedic patients. The challenge in caring for the orthopedic patient is in devising ways to carry out basic nursing care while understanding and working with orthopedic mechanical devices, such as splints, casts, traction devices, and turning frames, that are used in treating and aiding the healing process of bone fractures, joint disorders, muscle and nerve injuries, and other affections of the musculoskeletal system. Usually, the injured part and associated structures must be immobilized, while at the same time circulation must be maintained and muscles used to prevent atrophy. The average orthopedic patient is a long-term patient, whether undergoing treatment in the hospital or on an outpatient basis. Following a period of intensive treatment, he must undergo a long period of supervised convalescence to insure optimum recovery. He can be expected to resent the necessary restrictions imposed upon him and to become impatient or discouraged. Therefore, every patient must be taught and encouraged to become as self-reliant as possible, while at the same time he must understand the limits ordered by the doctor to insure healing and regaining of function.

5-115. Common Orthopedic Conditions

a. Under both peacetime and combat conditions, orthopedic patients account for a high percentage of occupied hospital beds and outpatient clinic visits. Usually the greatest number of patients will be under treatment for fractures due to trauma. The medical specialist is likely to encounter orthopedic conditions caused by—

(1) *Trauma.* Fractures, dislocations, sprains, and strains. In addition to injury to bones and joints, there are complicating factors of injury to

muscles, tendons, blood vessels and nerves, and often large open wounds are involved.

(2) *Disease.* Arthritis, osteomyelitis, neoplasms (both benign and malignant), and tuberculosis.

(3) *Congenital deformities.* Congenital dislocation of the hip and talipes (clubfoot). The medical specialist will usually encounter these conditions on the pediatric service (ch. 10).

(4) *Development defects.* Foot ailments such as flatfoot and bunions and spinal deformities due to abnormal or exaggerated spinal curvatures such as kyphosis and scoliosis.

(5) *Post-disease or post-trauma paralysis.* Residual paralysis from disease or from trauma of the extremities or trauma that damaged the spinal cord. Residual muscle paralysis from a disease such as poliomyelitis (infantile paralysis) may be treated surgically on the orthopedic service, or the orthopedic surgeon may refer the patient to the orthopedic brace shop. At other times, surgery and bracing will both be used. Other types of paralysis may be similarly treated. The medical specialist will find that, in AMEDD facilities, injury to the central nervous system is usually treated on the neurosurgical service; however, some conditions are also treated on the orthopedic service.

b. TM 8-231 gives additional information on these and other orthopedic conditions.

c. For emergency treatment of fractures, refer to FM 21-11 and chapter 8, this manual.

5-116. Healing of Fractures

a. When a bone breaks, there is always an injury to the periosteum (the membrane that covers the bone) and to the surrounding tissues. There is also hemorrhage about the ends of the fragments, and the space between the two fragments rapidly becomes filled with a blood clot. This blood clot is invaded by cells which form granulation tissue; this then forms a union of fibrous tissue known as a soft callus between the ends of the bone. Next, bone-forming cells begin growing in from the periosteum. (If the periosteum has been torn away or killed, these cells are not present.) They gradually form the soft callus into a hard callus, making a firm bony union between the broken ends of the bone. In treatment of fractures, the bones are brought into proper alinement and immobilized until X-ray shows that a hard callus has been formed.

b. Many conditions can interfere with the proper healing of a fracture; *for example—*

(1) *Poor blood supply.* If one of the parts of the broken bone is not supplied by blood, that part may die and union will not take place. This is prone to occur in the neck of the femur, the patella, the elbow end of the radius, and several other places where circulation is poor.

(2) *Poor immobilization.* If the fracture is not properly splinted and motion continually takes place at the site of fracture, the bony union will not take place.

(3) *Infection.* If the fracture site becomes and remains infected, union will not take place. There is a great danger of this occurring in open fractures because infection takes place through the open wound.

NOTE

Dressing technique on an orthopedic ward must be faultless to prevent wound and bone infection. In addition to strict asepsis for ALL patients, it is customary to place patients with infected wounds in a ward separate from one in which there are patients with clean wounds.

(4) *Interposition of soft parts.* If a piece of muscle or other tissue gets between the ends of the broken bone, bony union cannot take place.

(5) *Dietary deficiency.* If the diet of the patient does not include enough calcium or other minerals, new bone cannot be formed.

(6) *Pathological fractures.* These are fractures due to a disease process which causes a gradual weakening within the bone. Parathyroid disease (hyperparathyroidism), syphilis (when untreated or inadequately treated), bone tumors, and other diseases can weaken a bone so that only slight stress is needed to fracture it, and the disease of the bone may impede or prevent union.

5-117. General Nursing Care for All Orthopedic Patients

a. Skin Care. Besides basic hygiene measures, the orthopedic patient needs special skin care. Since he is often confined to his bed and in many cases is immobile because of a cast or traction, he is particularly susceptible to bed sores. Change the patient's position within permissible limits each 2 to 4 hours; give frequent alcohol (or skin lotion) rubs; and if rubber rings, sponges, or pads are used, use them cautiously, making sure that new areas of circumscribed pressure are not being

created and that there is a redistribution of body weight with relief of pressure area. Remember skin care includes attention to hair (brushing and shampoos) and toe and finger nails. Always provide a clean, smooth, dry bed, with wrinkle-free foundation sheets and bed clothing. Use orthopedic pajamas which are generously proportioned, with seams held closed by snap fasteners for ease in putting on and removing over casted areas. Patients in traction do not wear pajamas over the particular area in traction.

b. Diet. At first the orthopedic patient may have little or no appetite. He must often be fed while flat on his back or with both hands and arms immobilized. He must not be hurried and his meals should be as pleasant and as much of a social occasion as can be managed. The diet is ordered by the doctor, but it is a nursing responsibility to do everything possible to insure the patient's acceptance of it.

c. Elimination. A special effort must be made to prevent constipation and urinary complications when a patient is immobilized. Diet, fluid intake, prescribed exercises, and prompt attention to the patient's request for a urinal or bedpan are all important preventive measures. Special attention must be paid to proper placement of the urinal and the bedpan while maintaining the patient in alinement. The patient must often be assisted in cleansing himself after elimination, as casts and other orthopedic devices must be protected from becoming wet and soiled. A patient on crutches or up in a wheelchair who is permitted weight bearing on one leg can often be self-sufficient in getting himself on and off a toilet if provision has been made for grab bars and wide doors on toilet cubicles and the patient has been shown how to transfer himself safely to and from the commode.

d. Maintaining the Patient's Morale. Because of his long hospitalization, his immobility, and his fear of deformity, he may become unduly depressed or discouraged. Your understanding and encouragement can do much to support his morale. Encourage him to do as much for himself as possible. Give him help willingly when he asks for it, and use each occasion as an opportunity to teach him to be more self-reliant. In fostering self-reliance, ward personnel must be extremely safety conscious. Floors should be kept clean, clear of all obstacles, and nonslippery. The patient's bedside unit should be arranged in as orderly a manner as possible but always so that it is safe and usable for the patient and personnel. Occupational therapists and physical therapists help the patient to restore and strengthen muscle function, and he may have therapeutic exercise and diversional equipment at his bedside. The recreational and social services of the American Red Cross are important elements also in his social and personal life. Nursing personnel must be aware of all the different activities that contribute to total care of the orthopedic patient.

5–118. Devices Used in Caring for the Orthopedic Patient

a. General. New orthopedic devices are constantly being put into use, but all of them are directed toward a two-fold aim: to provide support for the injured part until it heals and to prevent deformity and stiffness of the injured muscles and joints. Support for the injured part may be provided by bandages; adhesive strapping; splints, including plastic inflatable ones; or plaster casts applied externally. Support may also be applied internally to a bone by using pins or plates. To prevent stiffness, the patient must use the affected part as much as possible within the limits ordered by the doctor. Physical therapy is usually begun as soon as possible and may be continued for an extended period of time following the healing of the affected part. The patient often needs the support of braces, splints, or crutches for some time after he becomes ambulatory.

b. Basic Ward Equipment.

(1) *Orthopedic bed.* The basic orthopedic bed is the standard hospital bed with a firm, nonsagging mattress. A slatted orthopedic bedboard (fracture board), placed between the spring and a thin firm, hair (or foam rubber) mattress may be ordered by the medical officer to replace the usual hospital innerspring mattress. The slatted construction of the bedboard permits adjustment of the bed gatch and also permits rolling of the bedboard for storage. Longitudinal boards, placed so as to rest on the end rails of the bedframe (not on the springs), may also be used.

(2) *Overhead bedframe.* The Balkan-type frame is illustrated in figure 5–91. Upright poles are clamped to the four corners of the bedframe, and the overhead, head, and foot bars and clamps are then adjusted to accommodate any traction and suspension system required. Unless otherwise ordered, the Balkan frame is provided for all traction patients. Any adjustment of the frame is usually done by the doctor or orthopedic specialist (MOS 91H).

(3) *Trapeze.* The trapeze (fig. 5–91) is provided when the patient is permitted to lift himself

Figure 5–91. The orthopedic bed set up with Balkan frame.

in bed. When a trapeze is used, instruct the patient how to use it. Proper use protects the elbows and heels from pressure and from friction burns caused by the bedsheet; it also maintains body alinement. The patient should not drag the weight of his body on the bed nor twist his spine. He should:

(*a*) Grasp the bar firmly.

(*b*) Flex the knee of the unaffected leg and place the foot flat on the mattress.

(*c*) Push down on the bed with the foot and pull straight up on the trapeze.

(4) *Wheelchair.* Several special precautions must be observed when orthopedic patients are permitted to use a wheelchair (fig. 5–92).

- If a patient is to ambulate when out of bed, he is not allowed to use a wheelchair.
- If a patient is allowed to propel himself in the chair he must be cautioned not to use the chair as a racing vehicle. Young, energetic patients often are tempted to use their chairs in a manner hazardous to themselves and to everyone else.
- When any patient gets in or out, the chair must be well stabilized so that it will not roll when the patient shifts weight or changes position. A fall will injure the patient physically and will also damage his self-confidence and self-esteem. The braking device, if any, is set, and the wheelchair braced against a wall or stable piece of furniture, or someone holds the chair for the patient. The method of getting into and out of a chair will depend upon the type of chair and the patient's disability.
- Adjustable chair. A patient in a large, bulky body cast that does not permit any bending at waist or hip may be lifted into an adjustable chair that has been prepared with pillows to support him in a semirecumbent position. This move from bed to chair provides welcome diversion from prolonged confinement to bed. The chair itself must be in perfect mechanical condition and the back and leg rests must be securely locked, once the rests are adjusted to conform to the patient's needs.
- Folding chair. The folding wheelchair is most commonly used for a patient who can sit up-

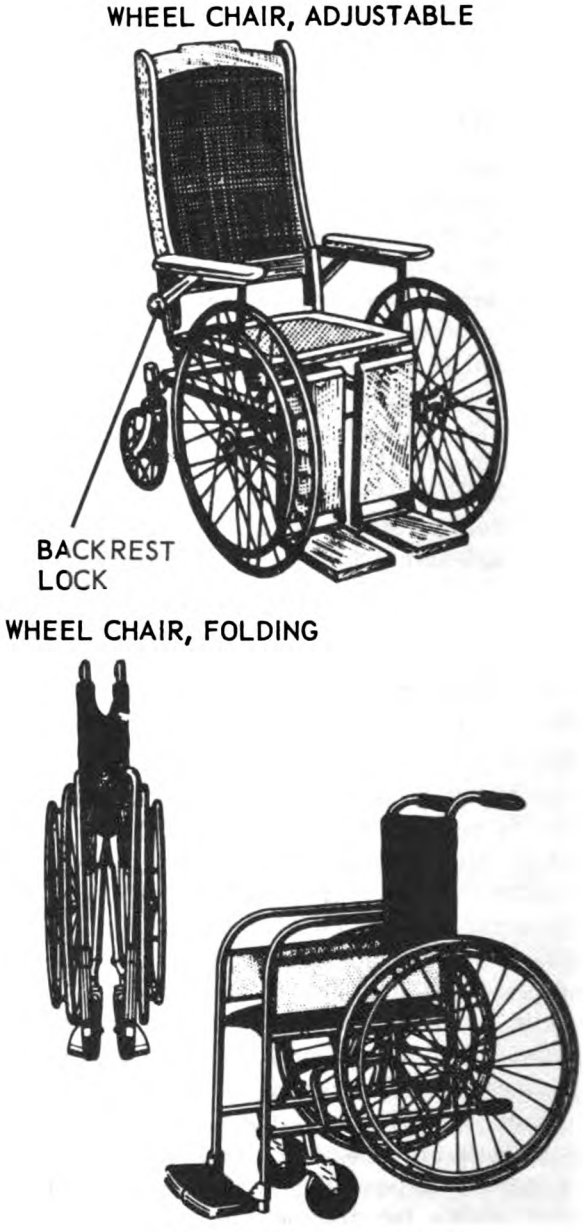


Figure 5–92. Wheelchairs.

right. If leg elevation is required, a board may be anchored under the seat cushion and pillow supports provided. In seating himself or getting out of the chair, the patient must be cautioned to fold back the footrests (if he attempts to stand on one, the chair will tip over); to support himself on the armrests as he lowers himself into the chair or pushes himself out of the chair; and in lifting himself from the chair, to place the leg on which weight bearing is permitted with the foot flat on the floor and slightly under the chair seat—he is then in position to push upright with his quadriceps (thigh) muscles and shoulder and arm muscles.

5–119. Assisting With Care of the Patient in a Cast

a. General. Casts are applied to maintain a part of the body in a fixed position. They are used in the treatment of fractures to immobilize and hold bone fragments in position for healing, to prevent movement in soft-tissue injuries, and to correct and maintain proper alinement in the treatment of deformities. The cast is usually applied by the medical officer and the orthopedic specialist, who works under the supervision and direction of the medical officer. In special situations, in the absence of an orthopedic specialist, the medical specialist may be required to assist the medical officer in the application of the cast; for example, in a dispensary, an outpatient may require application of a standard arm cast or a leg cast. Should this occasion arise, the medical specialist will follow the physician's orders; he will never attempt to apply or alter a cast except under the direct supervision of the physician. In preparation for this type of assistance, he should refer to TM 8–231. In addition, he should visit a hospital cast room and be oriented to basic cast equipment and cast application techniques by an experienced orthopedic specialist.

b. Care of the Patient in a Cast. It is a nursing responsibility to care for the patient while preserving the efficiency of the cast. (The efficiency of the cast is its ability to maintain the position for which it has been applied over the period of time necessary to accomplish the doctor's purpose.)

(1) Handle a wet cast carefully. A newly applied cast is set and firm when the patient leaves the cast room, but the cast is still damp. It requires 24 to 48 hours to become dry and hard.

(*a*) Prepare the bed to receive the patient. If the patient has been anesthetized, complete the foundation as for the postoperative bed.

(*b*) Provide plastic-protected pillows to support the cast along its entire length. Never permit the wet cast to rest directly on a flat, firm surface, because this will flatten the molded contours of the cast and cause pressure within the cast.

(*c*) Handle the damp cast by lifting and supporting it on a pillow or on the palms of the hands. Avoid using the fingers, as they will leave indentations which cause pressure within the cast.

(*d*) Never cover a damp cast. Leave it exposed to free air circulation. This is essential, as a drying cast generates heat within the plaster itself. In hot and humid weather the patient can suffer from excessive heat build-up and may need an electric fan directed toward the drying cast for improved air circulation and cooling.

(2) Observe an extremity encased in plaster for impairment of circulation.

(*a*) Inspect fingers and toes, and make sure all are visible.

(*b*) Check fingers and toes of inclosed extremity and compare them with the uninvolved extremity for numbness, coldness, swelling, and ability to move voluntarily.

(*c*) Use the blanching test. Compress the nail of the patient's thumb or the great toe of the limb in the cast with the fingers momentarily and then release the pressure. The nail should blanch (turn white) on pressure but the pink color should return immediately. Failure to blanch indicates impaired venous circulation and congestion of tissues; failure of the pink color to return immediately indicates impaired arterial circulation. In either case, report abnormal signs immediately, day or night. Do not wait. Permanent paralysis of a hand or foot can result from impaired circulation caused by cast pressure.

(3) Check for complaints of a burning sensation, numbness, tingling, pressure, or pain within the cast. Report the location and nature of the complaint.

(4) Elevate an extremity in a newly applied cast for the first 24 to 48 hours to prevent and relieve edema, which frequently develops soon after application of the cast. Elevation and ice bag application are often ordered. When a newly applied cast is elevated, it should be supported along its entire length, on an inclined plane, with distal joints higher than proximal joints—*for example,* hand higher than elbow, elbow higher than shoulder.

NOTE

If ice bags are ordered, suspend ice bags on either side, saddlebag fashion. Do not lay bags directly on the damp cast. Place ice bags in 6-inch wide stockinette sleeves and hang the sleeves on an IV pole so that the ice bags are in contact with the designated area of the cast.

(5) Turn the patient, while supporting the cast at the joints, to allow all parts of the cast to dry. Remove and replace pillowcases if damp. Note any signs of pressure of cast edges on skin. Arrange pillow supports to relieve pressure, as well as to maintain posture and alinement.

c. Finishing and Protecting Cast Edges.

(1) Cast edges may have been trimmed and finished with a smooth edge at the time of application, or edges may be finished after the cast is completely dry. The smooth finished edge prevents crumbs of plaster from working loose and settling inside the cast or in the bed where they would cause pressure sores.

(*a*) Stockinette lining finish. Pull the free end of the stockinette lining out and fold it back smoothly over the edges of the cast. Tape the stockinette edge to the thoroughly dry cast.

(*b*) Adhesive petal finish. When there is not enough stockinette or other lining material to pull over the cast edge, use adhesive tape prepared as follows (fig. 5–93):

1. Cut 1-inch (or wider) adhesive in 12-inch strips.

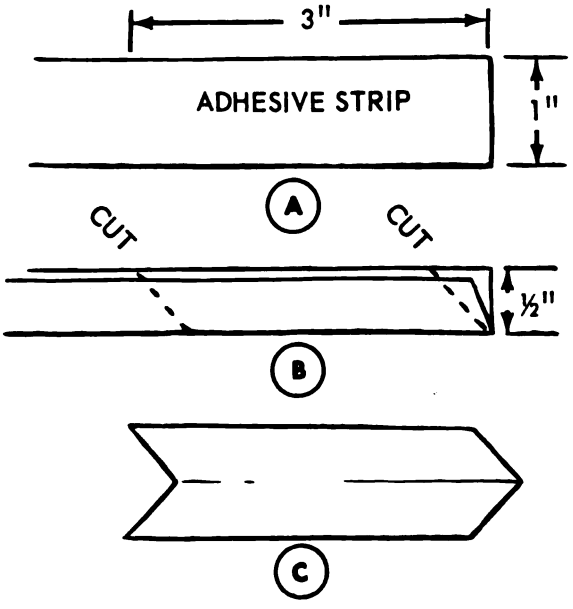


Figure 5–93. Petaling edges of cast.

2. Fold tape strips lengthwise, cloth sides together (sticky sides out).

3. At 3-inch intervals, cut pieces at a 45° angle to form petals.

4. Open each petal. Place the double point inside the cast. Overlap the petals smoothly, both inside and outside.

(2) The buttock and perineal edges of a hip spica cast and the top edge of a long leg cast should be protected with moisture-proof material such as plastic film to prevent soiling and moisture accumulation. Soiled cast lining and cast edges will cause skin irritation and a moldy, odorous, weakened cast. The adult male patient may require posterior protection only when using a bedpan, but the female patient and all children will require more complete protection.

(*a*) Cut strips of plastic in 4- to 6-inch widths. Fit overlapping strips smoothly under the cast and secure the free ends to the outside.

(*b*) Replace soiled strips with clean, dry strips. Pull out the strips at least once daily and check the lining and the cast beneath the waterproofing for soiling and moisture accumulation.

(*c*) Never apply waterproofing strips to a damp lining or plaster area. Air-dry the cast and lining before reapplying plastic.

d. Observation and Care of Skin.

(1) Look at all edges of the cast and all skin areas where the cast edges may cause pressure. Change the position of the patient and elevate and support the cast to relieve pressure. If there are signs of edema or circulatory impairment, notify the nurse or doctor immediately.

(2) Slip fingers under cast edges as far as it is possible to reach to detect any plaster crumbs or other foreign material that may have worked under the cast edge. Move the skin gently back and forth with fingertips to stimulate circulation.

(3) Lean down and smell cast edges, cast areas covering bony prominences and joints, and cast area covering wounds to detect odors indicating tissue damage. A musty or moldy odor at the surface of the cast may be the first indication that necrosis from pressure has developed beneath the cast.

(4) Check all other uncasted skin areas to detect signs of pressure. Be alert to any tendency of the patient to use heels and elbows to brace or push himself up in bed. Remind him to use the trapeze properly.

(5) Use cotton-tipped applicators moistened with alcohol to cleanse web spaces between the

toes of a casted foot and between the fingers of a casted hand.

(6) Relieve itching under a body cast by using a scratcher made of flannel or gauze bandages which are run lengthwise to extend above and below the cast. Tie the ends together on the outside of the cast. Moving the strip back and forth provides friction to relieve the itch with no danger of actually scratching or otherwise damaging the skin. Replace a soiled strip by tying on a clean one and pulling it through. Warn the patient not to use coathanger wire loops or any material which may damage skin. Blowing cool air through the cast with an electric fan will often relieve an itching spot that cannot be reached otherwise.

5-120. Turning and Positioning the Patient in a Hip Spica Cast

The hip spica is a large, heavy body cast inclosing the patient in plaster from above the waist to, and usually including, one foot or both feet. A one-and-one-half spica includes the trunk, both hips, one thigh, and one leg; the double hip spica includes the trunk, both hips, and both legs. Genitalia, buttocks, and the toes of the casted leg, or legs, are not inclosed in plaster. The patient in a newly applied hip spica is lifted into bed and placed supine on supporting pillows. He must then be turned alternately from back to abdomen to permit the cast to dry, to redistribute body weight so as to prevent pressure areas, and to help aerate the lungs and prevent respiratory complications. In general, he is turned initially on the doctor's order the first evening of cast application; then for as long as he is in the cast, he must be turned at least 4 times daily. Until the cast is thoroughly dry, three individuals should turn the patient so that there is no strain on the patient or on the damp cast. As the patient becomes accustomed to the cast and learns to help himself, one assistant will usually be adequate.

CAUTION

In turning at any time, the affected hip and leg (the "bad side") must always be uppermost; the patient "turns on the good side." The abduction bar of the cast (fig. 5-94) should never be grasped as this would weaken the cast.

PROCEDURE

Turning and Positioning from Supine to Prone (Damp Cast)

1. Use 3 people, 1 to be team leader, 2 and 3 to be assistants.
2. Have 4 plastic protected pillows in clean, dry, pillowcases at the side of the bed toward which the patient is to turn.
3. Tell the patient what is to be done and how he can help.
4. Stand on the side of the bed corresponding to the affected hip and, on signal, pull the pillows on which the patient is lying and the patient simultaneously toward you. (Do not, for example, move the patient's head and shoulders and then his hips; his entire body must be moved simultaneously.) Do not exert any pull on the cast.
5. Have assistants 1 and 2 go to the opposite side of the bed. Assistant 3 remains on the original side. Assistants 1 and 2 tighten the drawsheet, remove all plaster crumbs, and arrange the 4 pillows as illustrated in figure 5-94Ⓐ.

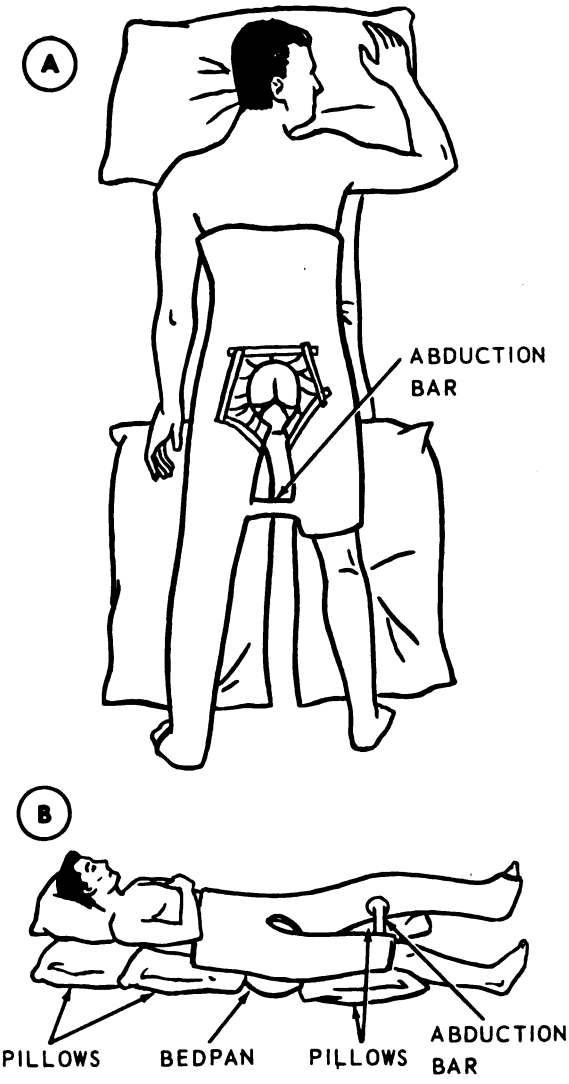


Figure 5-94. Patient in hip spica cast Ⓐ prone and Ⓑ supine position.

There must be no breaks in the pillow support for the entire length of the cast.

6. Have assistant 3 remove the pillow from beneath the patient's head. Instruct the patient to place the arm on which he is about to be turned above his head.
7. On signal from assistant 1 and in unison, turn the patient, all of his body being turned at exactly the same time. Assistant 3 slips his hands, palms up, under the patient's unaffected hip and shoulder and draws the patient toward himself while assistant 1 places his hands, palms down, on the affected hip and corresponding shoulder and simultaneously eases the patient over toward himself. Assistant 2 stands by to support the thigh and leg of the affected side on his palms as the patient is turned over onto his abdomen.
8. When turned, check the pillows supporting both legs. Always allow the toes to hang free and not be pushed in against the pillow or the mattress. In a widely abducted cast, the toes of the foot in plaster will probably hang free over the side edge of the mattress.
9. Check to make sure the cast edges are not pressing into the chest and pubis.
10. Adjust the pillow under the head for comfort and good alinement of the head, neck, and shoulders.
11. Wash the exposed back and buttocks, dry thoroughly, and rub with lotion. Slip your hand, palm down, under all edges of the cast, remove any plaster crumbs, and then gently rub the skin to stimulate circulation.
12. Check buttocks' edge of the cast for any rough spots. The cast edges cannot be finished until the cast is completely dry, but it may be possible to pull the lining down slightly, turn its edge over, and tape it temporarily.
13. Encourage the patient to lie prone for the prescribed period. This may be for an hour or more this first time. Encourage him to flex and extend his uncasted leg and to move the toes of both feet.
14. Use 3 assistants and repeat all precautions when turning again to supine position.

Pillow Supports When in Supine Position

1. Support the lumbar curve with a small thin pillow or a sheet folded into a 6-inch by 20-inch oblong. This support will prevent sagging of the cast and pressure on the abdomen.
2. Support the casted leg, or legs, along the entire length of the cast, but allow the heel to extend beyond the pillow to avoid pressure.
3. Check pillow alinement, particularly at junction of leg and body sections. This is usually the weakest part of the cast, and any sagging should be prevented.

Assisting With Urinal or Bedpan

1. Elevate the back and shoulders slightly with pillows (or gatch if permissible), to prevent moisture from running back under the cast.
2. Assist the male patient p.r.n. with placement of the urinal.
3. Use an emesis basin, slipped in place lengthwise, for a female patient for voiding. The basin is easier to place and remove than a bedpan.
4. In bedpan placement for the male or for the female patient, check to make sure that the buttocks are resting on the rim of the pan and that the head, shoulders, and back are higher than the buttocks (fig. 5–94Ⓑ).
5. When a trapeze can be used, instruct the patient to lift straight up to avoid friction on the skin while placing and removing the bedpan.
6. After using urinal or bedpan, assist the patient to clean himself thoroughly, using tissue, soap, and water. Check cast edges for soiling. If not enough cutout room has been left for proper use of the bedpan and for skin care, call this to the attention of the nurse or doctor for correction.

5–121. Instructions for Patient in an Arm or Leg Cast

Although patients with extensive body casts require more personal care than do patients with arm and leg casts, the medical specialist must continue to observe and help his more self-reliant patients. They must be taught to care for their casts, whether they are outpatients or hospitalized patients. General instructions for the patient include the following:

a. Cast Care.

(1) Do not walk on new walking casts for a period of 24 hours.

(2) Keep all casts dry.

(3) Do not alter casts.

(4) Do not remove casts.

(5) Do not put foreign objects inside of casts.

b. Prevention of Complications.

(1) To prevent swelling when a cast is applied to a limb, elevate the limb for 2 days.

(2) Report pressure points.

(3) If a cast becomes soft or broken, return for repairs.

(4) If a cast becomes too loose, return for a new one.

(5) If in doubt, return to have the cast checked.

(6) Follow the physician's orders.

c. Use Arm Sling. The type of sling required will depend upon the type of cast applied. A standard short arm cast or long arm cast can usually be adequately supported with the triangular bandage sling (fig. 5–95). If support from both shoulders is permitted, apply the sling as illustrated in figure 5–95Ⓐ, making sure the knot is tied to one side of the neck to prevent pressure on the affected side. To support the casted arm without pressure on the clavicle or shoulder on the affected side, apply the sling as illustrated in figure 5–95Ⓑ, making sure the knot does not cause pressure on the scapula. When the cast includes the elbow, the cast is usually applied with the elbow flexed at a 90-degree angle, and the casted arm and hand is therefore supported at waist level. A hanging cast (fig. 5–96) is not supported with a triangular sling. At the time of cast application, a wire loop is incorporated into the cast, and the cast is suspended from the neck by a padded tubular loop alined to the midline of the body. The neck loop ends are inserted through the cast loop in opposite directions and tied to the cast loop to suspend the cast at the height determined by the physician to maintain the desired gravity-pull.

d. Walking Casts. A walking iron or rubber heel is incorporated into the leg cast of a patient permitted to bear weight on the casted leg. A cast sock should be used. A well-fitting shoe should be

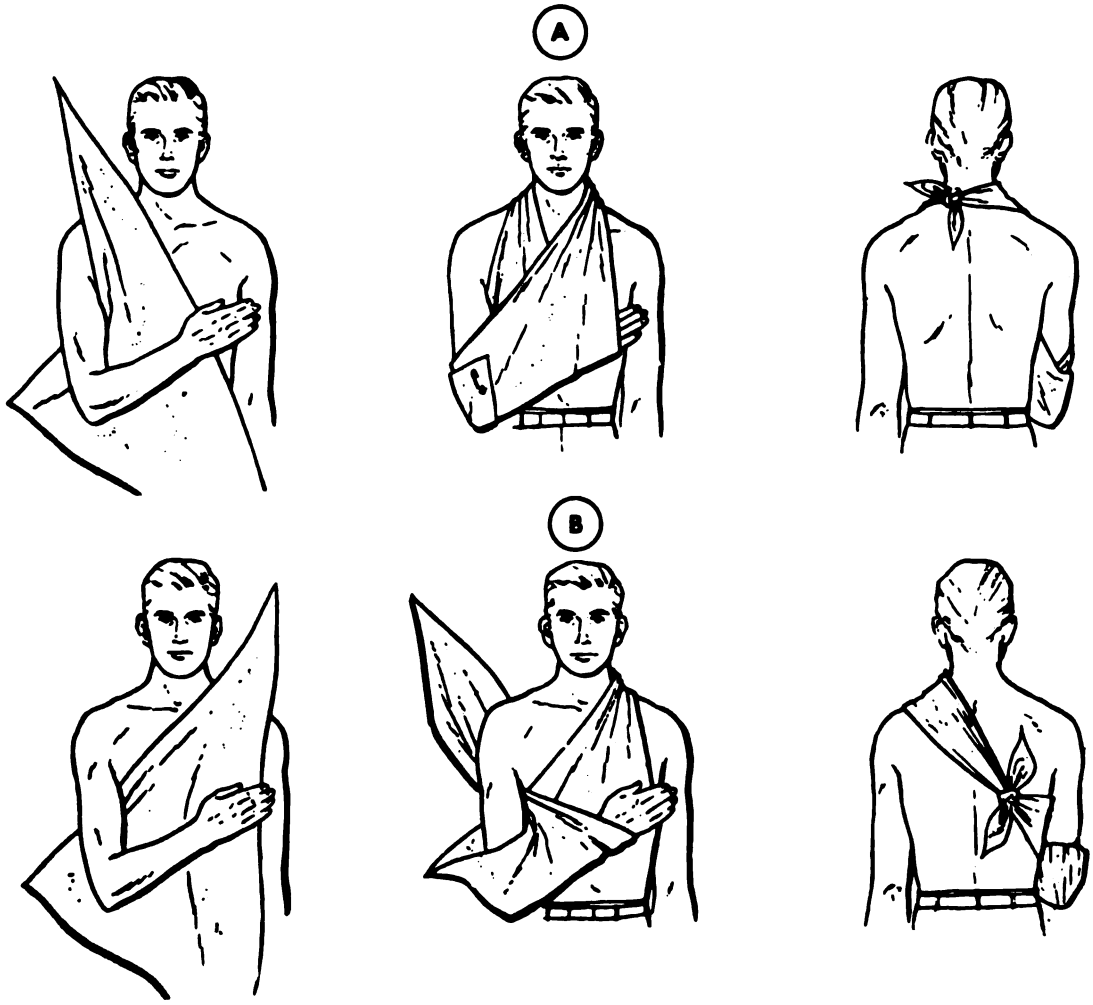


Figure 5–95. Applications of triangular bandage to form a sling (two methods).

Figure 5-96. The hanging cast support.

worn on the uncasted foot and an elevator is usually attached to the shoe to maintain normal body alinement. Remind the patient to walk with his casted foot straight forward and not in eversion. The cast edges at the toes should be watched for weakened, cracking areas. The patient must be reminded to elevate the leg in the cast when sitting; walking stimulates circulation, but some swelling may develop when the patient sits with the casted leg hanging down.

5-122. Cast Cutting and Cast Removal

Casts may be cut (but the entire cast may not be removed from the casted area) for different reasons—to allow for wound dressings, to examine a painful area, or to relieve pressure. The medical specialist may be required to assist with cast cutting at the bedside as an emergency measure to relieve pressure.

a. Bivalving the Cast. Bivalving is the recommended method for emergency cutting of the cast to relieve pressure. In bivalving, the cast must be cut along its entire length on two sides, medial and lateral, and the base material (lining or padding) cut completely down to the skin along its entire length. If the cast or the lining is split only part way, the congestion will be increased and additional tissue damage will occur. To cut the cast, use a knife, a hand cutter, or an electric cast cutter; use bandage scissors to cut the base material down to the skin. To use a knife for emergency cast cutting, follow these steps—

(1) Make a shallow groove to indicate the cutting lines on both sides of the cast.

(2) Apply water or peroxide along the cutting lines with a syringe to soften the plaster.

(3) With the knife, cut through the successive layers of plaster along the cutting line. Do not attempt to slice through all layers at once.

(4) With scissors, cut through the base lining material down to the skin. Cut every thread of the lining material completely through, since the lining is sometimes the source of the trouble.

(5) Tape the bivalved cast together loosely to maintain support of the casted part until further instructions are obtained.

b. Windowing the Cast. This may be done on specific order, but it is a more hazardous procedure than bivalving because the underlying tissue may bulge through the window opening, causing "window edema." If a window is cut, the piece of plaster removed should be saved. The doctor indicates the area to be windowed. After he examines and treats the underlying area, a padded compression dressing may be applied over the exposed skin area and the cutout piece of plaster bound in place to the cast to prevent "window edema."

c. Patient Care After Cast Removal.

(1) Continue to provide support to joints and normal body curves. The muscles will have become weakened from disuse, and although movement is encouraged, support is necessary. Firm pillow supports when patient is in bed, a sling for his arm when the cast is removed, and cotton elastic bandages for his arm or leg may be necessary.

(2) Avoid soaking or any vigorous attempts to remove skin exudate and crusty scales which are commonly present when the cast has been on for several weeks. Application of oil for several days after cast removal may be recommended.

(3) If a bivalved cast shell is to be used for support, tape the edges and check the lining. Remove all plaster crumbs. Use care in storing the cast shell when not in use. A spica or body cast shell is bulky and easily damaged. The safest storage place may be on a clean sheet under the bed or the cast may be hung from a hook on the wall. (The Balkan frame may seem to be a handy rack for the cast shell, but this could be hazardous if the cast falls on the patient or on another person.)

5–123. Care of the Patient in Traction

a. General. Traction is used to promote and maintain alinement of broken bones and to relieve muscle spasm and pain. It is an exertion of pull usually accomplished by traction apparatus. To maintain traction and body alinement, countertraction (exertion of pull in the opposite direction) must be present. When traction is applied to a lower extremity, the foot of the bed may be elevated when the patient's body weight supplies countertraction.

b. Major Methods of Applying Traction. The major methods of applying traction are referred to as skin traction and skeletal traction.

(1) *Skin traction.* In skin traction, adhesive material is applied to a limb, or a halter is fitted to the patient's head or pelvis. The adhesive material or the halter is then attached to traction apparatus, and force is exerted by means of a pulley and weights.

(2) *Skeletal traction.* In skeletal traction, force is exerted directly on the bone by means of tongs inserted in the skull for reduction and maintenance of bone alinement in cervical spine injuries or by means of a pin or wire inserted through bone distal to the fracture in extremity fractures. The tong, pin, or wire is then attached to the traction apparatus, and force is exerted by means of pulleys and weights. A greater pull can be exerted by means of skeletal traction than by skin traction.

c. Preparing the Patient and His Unit for Traction. There are many local variations in traction procedures, depending upon the preferences of the orthopedic surgeon. The nursing procedures described for the care of patients in traction are guidelines that are subject to amendment by specific orders of the medical officer. In general, in AMEDD hospitals, an orthopedic specialist assists the doctor in application of traction. The medical specialist may be required to assist occasionally, but his primary responsibility lies in nursing care. In order to give effective nursing care, he should have an understanding of the basic forms of traction used and recognize some principal features of standard traction apparatus. This is because in caring for the patient he is responsible for recognizing and reporting defects at once so that the defect can be corrected by qualified personnel.

PROCEDURE

1. Prepare the bed with a thin, firm mattress and an orthopedic bedboard. Check as to whether shock blocks or other elevators are to be used at the head or foot of the bed. The patient is often positioned on an incline to provide countertraction through his own body weight.
2. Provide a footboard or sandbags to support the foot that is not in traction. Foot support for the leg in traction is usually provided by means of the footrest when the traction is applied.
3. Use a complete overhead Balkan frame with trapeze, or use only an orthopedic foot or head bar, depending on the type of traction to be used.
4. Provide two or more firm, plastic-protected pillows.
5. Make the foundation of the bed with a drawsheet. Omit the top linen, or fold it back evenly

to the edge of the mattress to allow for necessary adjustment according to the placement of the traction ropes.

Preparing the Patient

1. Remove pajama trousers for application of traction to lower limb. Provide a towel for a loin cloth drape.
2. Remove pajama coat for application of arm or cervical traction; if the coat is used, it can be placed back to front.
3. Offer bedpan or urinal before the application procedure starts.

5–124. General Observations—Traction Apparatus

In caring for the patient in traction, the following points should be observed routinely and any defect noticed should be reported and corrected:

a. Weights. The weights must hang free. Bumping into them must be avoided because it causes them to swing back and forth. Each weight bag must be tied securely to its rope.

b. Ropes. There should be no frayed spots or knots in the running length and no dragging on the bedframe or bedcovers. Ropes should not rest against each other.

c. Pulleys. The rope should rest securely in the pulley grooves. Pulley clamps must be securely attached to the bedframe and must never be moved except as directed by the doctor.

d. Spreader Bars. The spreader bars should cause no pressure on adjacent skin areas.

e. Foot Plate. The foot plate should maintain and support the foot in neutral position, with no pressure on either side of the foot, the heel, or toes. It must not rest against the end of the bed —this interferes with the traction pull.

f. Trapeze. This is suspended from the overhead bars so that the patient can reach and grasp it without strain and without twisting out of alinement.

g. Hammocks, Slings, and Halters. These should be free of wrinkles and cause no pressure on bony prominences or joints. If padding material is used, it must be clean, dry, and free of wrinkles and crumbs.

5–125. General Nursing Measures—Skin Traction

a. Skin Preparation. Check with the doctor as to whether the skin is to be shaved. Shaving is not always advised because of the possibility of skin irritation or subsequent ingrowing hair problems. The doctor may request that the skin be painted with compound tincture of benzoine; if this is done, it must be dry before the adhesive or moleskin is applied.

b. Application of Traction.

(1) Assist with application of skin traction and arrangement of traction apparatus as directed by the doctor.

(2) Understand the nature of the traction and the position and permissible patient movement to maintain the desired traction pull. Position and permissible movement differ according to the type of traction used, and these factors determine the planning of basic nursing care.

BUCK'S EXTENSION

This form of skin traction to the lower limb (fig. 5–97) provides for straight pull through a single pulley attached to a crossbar at the foot of the bed. The limb in traction lies parallel to the bed. The foot of the bed is elevated to provide countertraction and to help keep the patient from being pulled down to the foot. Usually, in Buck's extension the patient is not permitted to turn and must remain flat on his back.

Special Nursing Observations and Care

1. Check alinement of leg to maintain a straight pull from the rope attached to the center of the spreader block to the pulley mounted on the foot bar of the bed.
2. If pillow support for the leg in traction is prescribed, use a thin, firm pillow, leaving the patient's heel free to avoid pressure. The doctor may specify that only a plastic protector (no pillowcase) is to be used on the pillow. The plastic eliminates friction, and the traction is therefore more efficient.
3. Check tape strips visible on the lateral and medial sides of the leg and report immediately if tape is not adhering to skin or is slipping downward. Weight adjustment may be needed.
4. Check bandage wrappings to make sure they have not slipped downward, causing pressure on dorsum of foot and on Achilles tendon.
5. Check tape attachments to spreader block to make sure tape is not pulling away from malleoli or cutting into lateral and medial sides of the foot. If either condition is noted, the foot may be out of alinement or the spreader may need replacement.

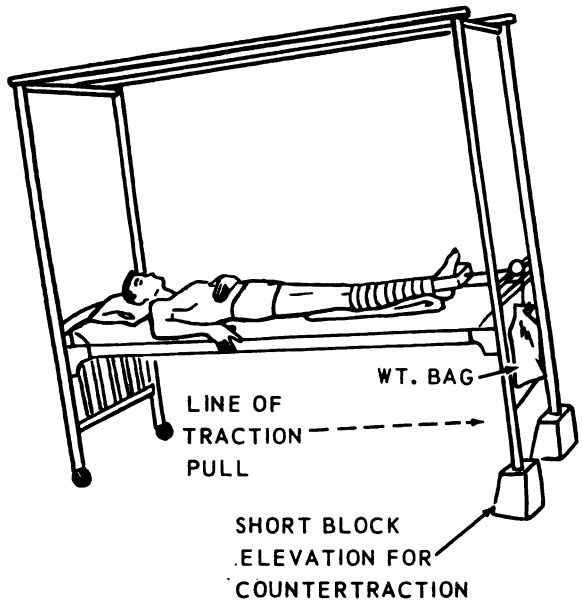


Figure 5-97. Buck's extension.

6. Observe the exposed toes for color, edema, coldness, or numbness.
7. Observe the foot for any tendency to turn in inversion (toward the midline).
8. Listen to any complaint of a burning sensation on the lateral side of the leg. This may be an indication of peroneal nerve involvement. This nerve lies close to the lateral surface of the leg at a point just below the knee and can be damaged by compression, causing paralysis of the foot.
9. To give a patient back care when he cannot turn or lift himself from the mattress by means of a trapeze, depress the mattress with one hand, while slipping the other hand under his back to reach all the skin area.
10. To place the patient on a bedpan, have an assistant support the patient while the mattress is depressed and the bedpan is slipped into place. Slip a sheet-roll support in the lumbar curve to keep the back level with the bedpan. Check to see that the skin is clean and dry after the bedpan has been removed.
11. Check the uninvolved limb to make sure it is not in a position of external rotation of the hip. Encourage the patient to toe in at intervals. Provide sandbags for foot exercise part of the time and encourage the patient to push against the firm bags.
12. Encourage and assist the patient to take 10 to 15 deep breaths every waking hour to prevent hypostatic pneumonia (pneumonia resulting from immobilization).
13. To change the foundation sheet and drawsheet, start on the side opposite the traction, and pull the linen smoothly through under the side in traction. Fold back the top linen neatly toward the center of the bed to avoid any contact with traction ropes. Use a separate small cover if the limb in traction needs to be covered for warmth; a bath towel or pillowcase may be adequate.
14. Place the bedside stand, the signal cord, and personal articles where the patient can reach them without twisting or turning.
15. Encourage the patient to reach overhead and grasp the head bars to exercise his shoulders and help his chest muscles expand.

RUSSELL TRACTION

In this form of skin traction (fig. 5-98), a system of suspension and traction pull is used. Adhesive strips are applied as in Buck's extension. In addition, the knee is suspended in a canvas sling. A felt pad is usually placed between the sling and the skin. A rope is attached to a spreader bar above the sling. This rope passes over a pulley which is positioned on an overhead bar and is then directed to a system of three pulleys at the foot of the bed: first to the pulley on the bed foot bar, next to the pulley on the foot spreader bar, and then back to a second pulley on the bed foot bar. There is an upward pull from the hammock pulley and a forward pull from the foot of the bed pulleys. In Russell traction, the angle between the thigh and the bed is approximately 20°—there is always slight flexion of the hip and knee. The

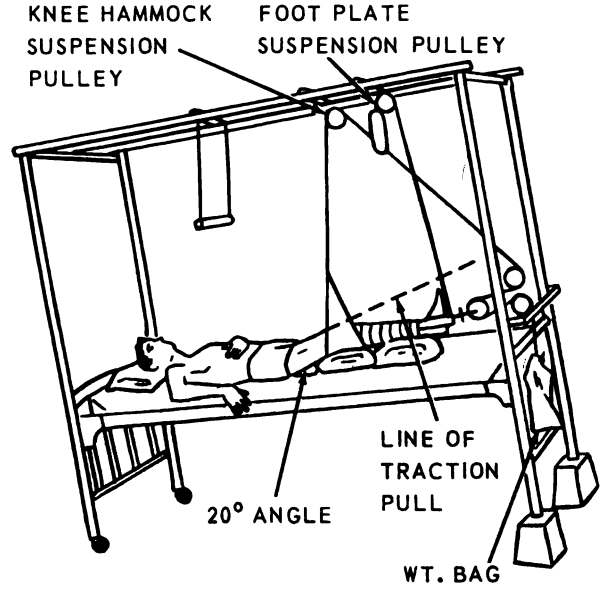


Figure 5-98. Diagram of Russell traction.

advantage of Russell traction is that some movement in bed is permissible. The patient can turn slightly toward the side in traction for back care, for placement on the bedpan, and for bedmaking.

Special Nursing Observations and Care

1. Check the popliteal space for any signs of pressure from the hammock such as ridging of the skin, redness, pain, or any discomfort.
2. Check the pillow supports—one pillow is to be lengthwise under the thigh and a second pillow under the leg, with the heel free.
3. Keep the patient from sliding down in bed. Countertraction, with the foot of the bed elevated, helps to prevent this.
4. Check all tape and bandage points as in Buck's extension.

PELVIC TRACTION GIRDLE

The pelvic traction girdle is ordinarily used for treatment of low back pain and muscle spasm. It is fitted snugly and evenly over the iliac crests. The traction straps, extending on the lateral side of each thigh, are hooked to a separate rope at about midthigh level, and each rope leads to a separate but equal weight at the foot of the bed. The foot of the bed is usually elevated to provide countertraction.

Special Nursing Observations and Care

1. Keep the girdle and the skin under the girdle clean and dry. Padding is usually avoided, unless the patient is very thin and the iliac crests are very prominent. Orders will specify when the pelvic girdle may be removed for skin care.

NOTE

Some patients are allowed out of bed for bathroom privileges only, and then traction is resumed.

2. Protect and support the feet. Foot exercises are usually encouraged, but there must be no contact with the traction ropes.

PELVIC TRACTION SLING

The pelvic traction sling is used for treatment of pelvic fracture. The patient is placed in a canvas sling (hammock) which is suspended by a tension spring attached to an overhead frame bar. The pelvis is suspended so that it is just off the mattress.

Special Nursing Observations and Care

1. Place padding along the skin in contact with the sling edges as needed to relieve pressure on the coccyx.
2. Keep the sling, the skin, and the padding clean and dry. It is usually permissible to fold the sling back in order to place the patient on a bedpan and to give skin care.

CERVICAL TRACTION HALTER

A canvas head halter is used for treatment of affections of the cervical spine. The halter fits snugly under the chin and at the back of the head against the occipital protuberance. Traction straps are attached to a centrally placed spreader bar to which the pulley rope is attached, and the weights prescribed keep the patient's neck and cervical area in a neutral position or as specified by the medical officer.

Special Nursing Observations and Care

1. Reverse the bed from head to foot to provide easier access to the patient's head.
2. Place the head of the bed far enough from the wall to insure free suspension of weights and free access to the patient.
3. Elevate the head of the bed on shock blocks or other elevating devices to provide countertraction.
4. Do not permit the patient's head or the spreader bar of the halter to rest against the bedrail.
5. Check frequently to insure that the chin strap is not pressing on the throat and that the spreader bar is not causing pressure on the angle of the jaw and the ears.
6. Slip your hand between the halter and the patient's skin to gently massage his chin, his jaw, and the back of his ears. Depress the mattress with one hand and slip the other hand to his head to massage the back of his scalp.
7. Give the patient back care at least q.2h. The doctor always specifies the amount of turning or shifting of the patient's weight. If no turning is permitted, depress the mattress with one hand, and wash and massage the patient's back and buttocks with the other hand.
8. Feed the patint slowly and with great care. Remind him to face forward and not to turn toward the spoon, fork, or drinking tube. Allow plenty of time for him to chew and swallow.
9. Keep suction equipment on hand for immediate use to prevent aspiration when feeding or giving mouth care. Remember, if he chokes, he cannot be turned or raised forward.

10. Remind the patient to take 10 deep breaths every hour when awake in order to aerate his lungs.
11. In bedmaking, loosen top foundation linen and draw it downward, head to foot.

5-126. General Nursing Measures—Skeletal Traction

a. Crutchfield or Vinke Tongs. These tongs are used for skeletal traction in the treatment of fractures of the cervical spine. The tong points are inserted in the parietal area of the skull (just in the outer layers of bone), and the tong is then attached to the pulling device. The procedures may be done under local anesthesia in the operating room or on the ward. When done on the ward, operating room personnel may be responsible for the head prep and for assisting with the insertion procedure. With skeletal skull traction, the nursing care of the patient is usually less difficult than when a halter is used—the patient's face and head are relatively free of pressure and some turning in "log-roll" fashion (head, shoulders, and pelvis turned simultaneously) may be permissible for back care and bedmaking.

(1) Prepare the bed, head to foot, as for cervical halter traction.

(2) Use an alternating pressure pad if one is available, when the patient is in a conventional bed. (The patient in tong traction may be immobilized for a long period, so he may be placed on a Foster frame.)

(3) Do not disturb or remove the dressings on the tong insertion wounds unless so ordered. Inspect both areas for drainage. Small dry dressings (or a surgical plastic spray) are usually all that are used. The doctor may request that the hair be kept shaved at the insertion points.

(4) Feed the patient slowly and with great care. Remind him to face forward and not to turn toward the spoon, fork, or drinking tube. Allow plenty of time for him to chew and swallow.

(5) Be constantly alert for any signs of respiratory distress. Instruct and assist the patient to take 10 deep breaths every hour.

b. Thomas Splint and Pearson Attachment (Skeletal Traction). The combination of skeletal traction and balanced suspension by means of the Thomas splint is widely used for treatment of fractures of the femoral shaft (fig. 5-99). This method of treatment provides considerable freedom of body movement while maintaining efficient

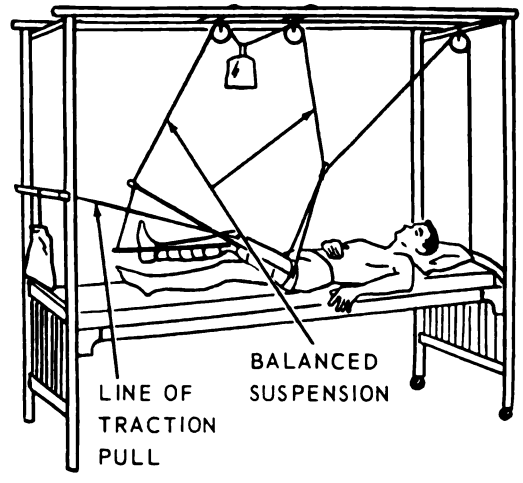


Figure 5-99. Skeletal traction-suspension: Thomas leg splint.

traction on the injured limb. Some special points in relation to nursing care are summarized as follows:

(1) *Skeletal traction wire (Kirschner) or pin (Steinmann).* The wire or pin insertion is always an aseptic surgical procedure, and is usually done in the OR. A local or a general anesthetic is used, and all preoperative and postoperative precautions must be taken. The wire or pin is inserted through the bone distal to the fracture and out through the skin on the opposite side. The small wounds made for the wire or pin insertion are dressed and these dressings must not be disturbed —the areas are observed for drainage or pain, but a "hands-off" policy is maintained. Corks should be placed over the sharp protruding wire ends. The patient must be reminded not to touch the dressings or any of the attachments.

(2) *Thomas Splint.* The half-ring (Army leg splint) is applied in various ways: with the ring fitted posteriorly against the ischium or anteriorly in the groin. The thigh rests in a canvas or bandage strip sling, with the popliteal space left free. Contrary to usual practice, the leather ring should not be padded or wrapped for protection; the padding gets damp and soiled and causes skin irritation. If kept smooth, dry, and polished, the leather of the ring is designed to rest against the skin and is moisture resistant. To give skin care, move the skin back and forth to wash under the ring, then dry the skin and ring thoroughly.

(3) *Pearson attachment.* This is attached by clamps to the Thomas splint at knee level. A canvas or bandage-strip sling supports the lower leg and provides the desired degree of knee flex-

ion. A foot plate is attached to the distal end of the Pearson attachment to support the foot in neutral position. The heel is always left free.

(4) *Line of pull.* Traction in line with the long axis of the femoral shaft is maintained by the rope, pulley, and weights attached to the skeletal tractor (U-shaped clamp), which is fitted onto the skeletal pin. Countertraction and balanced suspension are provided by the ropes, pulleys, and weights attached to the Thomas splint. When all is operational, the thigh and Thomas splint will usually be suspended at a 45-degree angle with the bed, and the lower leg and Pearson attachment will be suspended horizontal with the mattress. The patient may sit up, turn toward the traction side, and raise his hips above the bed by means of the trapeze and still maintain the line of traction.

(5) *Additional treatment.* The orthopedic surgeon will often order a rope, pulley, and weight arrangement to provide assistive exercise for the knee of the affected leg. The patient pulls on the designated weight suspended over his head to exercise his knee.

c. Arm Traction. In arm traction, either skin or skeletal, the upper arm is extended at a right angle to the bed, and the forearm is flexed and suspended over head. Countertraction is provided by tilting the bed sideways away from the traction apparatus; low shock blocks are placed under the head and foot on the side corresponding to the traction. The patient requiring this method of treatment usually has a severe injury to the humerus and elbow. Several important nursing responsibilities should be emphasized:

(1) Check the radial pulse on the affected side and compare it with the pulse on the unaffected side. Circulatory and nerve impairment is common in this type of injury, and a weak or absent pulse must be reported immediately.

(2) Check the hand and fingers for circulatory impairment. Swelling and blueness of the nails are danger signs. Emergency treatment for relieving these symptoms consists of removing the traction apparatus and bringing the arm into extension (arm at the side).

(3) Check to see that the elevated hand is kept in a position of function and that there is no pressure from the spreader bar or suspension apparatus. A hand bar for the patient to grasp to facilitate position and finger exercise is usually provided.

(4) Check for pressure points at the wrist.

(5) Know what movement in bed is permissible. The patient is usually required to remain flat, with no shoulder elevation. Some turning toward the traction side may be permissible for back care or bedmaking.

(6) Use caution in moving when at the bedside of a patient in traction in order to avoid bumping the weights or striking against the protruding traction apparatus. Extra space between beds is usually required.

5-127. Amputation Postoperative Care

Surgical amputation of lower or upper limbs is done to remove dead or unhealthy tissue that cannot be treated by any other means. In many instances, amputation is done as a lifesaving measure. The amputation may be necessary because of loss of blood supply due to severe crushing injury or to severe peripheral vascular disease; clostridial infection such as gas gangrene; or cancer. In some instances, amputation is advised to remove a deformed and useless limb to permit the fitting of a functional prosthesis. Whatever the reason, amputation is a major operative procedure. Preoperative and postoperative care is part of a long-range plan for the patient's rehabilitation. Members of the nursing team usually work closely with physical therapists who conduct on-ward patient teaching and physical conditioning programs until the patient is well enough to go to the physical therapy clinic. Continuous care and teaching is needed as the patient progresses to the point where he is fitted with a prosthesis and learns how to use it. The medical specialist needs to know some general principles of care, particularly of the amputation stump.

NOTE

Although only lower limb amputations are discussed here, it is important to realize that an upper limb amputation is often a greater handicap and requires equal consideration.

GENERAL NURSING MEASURES—EARLY POSTOPERATIVE CARE (LOWER LIMB AMPUTATION)

1. Carry out routine postoperative nursing measures as for any major operative procedure.
2. Keep a heavy tourniquet attached in clear view at the head or foot of the bed. Know how to apply the tourniquet immediately if sudden hemorrhage occurs. Request the responsible nurse or medical officer to demonstrate the tourniquet procedure to be used.

3. Watch for hemorrhage from the stump. Do not cover the stump dressing with bed clothing. Watch for bright red staining, report it immediately, and continue to watch for any increase in extent and rate of spread of the blood stain.
4. Maintain the prescribed position of the stump in traction, on a splint, or with prescribed pillow elevation. (If pillow elevation is prescribed for the first 12 to 24 hours postoperatively to lessen edema and oozing, the pillow is usually removed as soon as possible to prevent flexion contracture of the hip.)
   a. *Skin traction.* Following emergency amputation when the stump wound is not closed with a skin flap, a stockinette-skin-traction device is usually applied in surgery. Continuous traction is maintained to prevent retraction of the skin and muscle from the wound edges until closure is possible in a follow-up operation.
   b. *Splinting.* A padded-board knee splint may be used to maintain extension of the knee joint in below-knee amputations. The patient may have severe muscle spasms, and he can also develop a pressure sore from contact with the splint. Check the padding. Know when the splint may be removed for skin care and position change and exercise.
5. When change of position is permissible (usually within 24 hours postoperatively), turn the patient at regular intervals and at least twice daily to lie flat on his abdomen. Do not turn him just toward his abdomen. Check to see that both hip bones rest evenly on the mattress; this position helps to correct any tendency toward flexion contracture of the hip. While lying prone, encourage the patient to adduct the stump at intervals, moving it inward toward the unaffected leg. This exercise will help to correct the usual tendency toward abduction.
6. Encourage prescribed exercises to preserve range of motion of all joints of the affected limb and of the three other limbs to prepare the patient for crutch walking. Strengthened muscles are needed to use crutches effectively. Arms and shoulders must be exercised as well as the affected and unaffected leg. Alternating use of the trapeze, which strengthens biceps muscles, with pushup exercises to strengthen triceps muscles is usually advised. When a patient is not strong enough to do pushups, less strenuous exercise is often prescribed; *for example,* when lying supine he can lift shot bags held on his palms while keeping his arms extended.

STUMP BANDAGING

When the stump wound is healed, the stump must be conditioned and shaped for proper fitting of a prosthesis. Bandaging with a special technique is used to shrink and mold the stump to a smooth, conical shape. Patients are normally taught how to apply the bandage by a physical therapist. The recommended procedure usually is to remove and reapply the bandage twice daily and to wash and expose the stump to air before reapplying. Nursing supervision and assistance with stump bandaging on the ward is, therefore, customarily needed. During the shaping process, the bandage is worn day and night. Different methods are used in applying the bandage. One method of application for below-knee (B/K) amputation and for above-knee (A/K) amputation is illustrated in figure 5–100. The cotton elastic bandage must be applied to provide equal, firm compression in a crisscross or spiral pattern, with no circular turns that can constrict circulation.

5–128. Assisting With the Use of Crutches

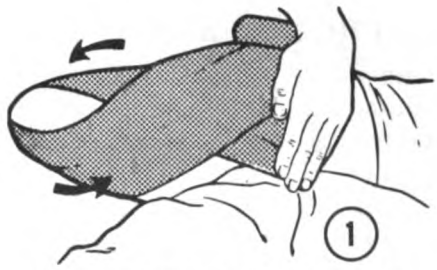
The use of crutches is a complicated procedure that is usually taught by a physical therapist. There are occasions, however, when the medical specialist may have this responsibility, particularly when crutches are to be used temporarily by a patient in good physical condition—*for example,* a patient who has been treated as an outpatient. The medical officer prescribes the use of crutches and the gait (crutch-walking) method to be used. The prescribed gait depends upon the amount of weight bearing permitted on the affected leg. The gait most commonly taught by the medical specialist is the "3-point" gait, with no weight borne on the affected leg. The crutches are moved with the affected limb (fig. 5–101).

PROCEDURE

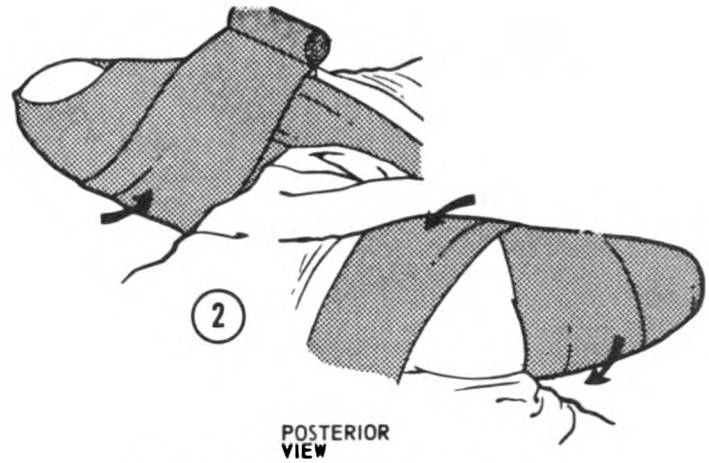
Measuring for Crutches

Crutches need two adjustments—the length of the crutch and the position of the hand grip. Rubber tips should be on the crutches, and the patient should wear a shoe on the unaffected side for the measurement.

1. Have the patient lie supine, hands at sides, wearing a shoe on the unaffected foot.
2. Using a tape measure, measure from the border of the axilla to the heel of the shoe plus 2

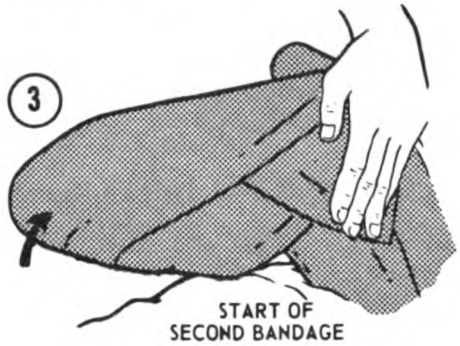


START FIRST BANDAGE IN THE INGUINAL AREA AND PROCEED DIAGONALLY AND LATERALLY OVER THE DISTAL STUMP. COVER THE POSTERIOR MEDIAL CORNER, THEN CONTINUE DIAGONALLY AND ANTERIORLY UP TO THE ANTERIOR ILIAC CREST, POSTERIORLY AROUND THE PELVIS. THERE WILL BE AN EXPOSED AREA OVER THE DISTAL LATERAL CORNER OF THE STUMP.

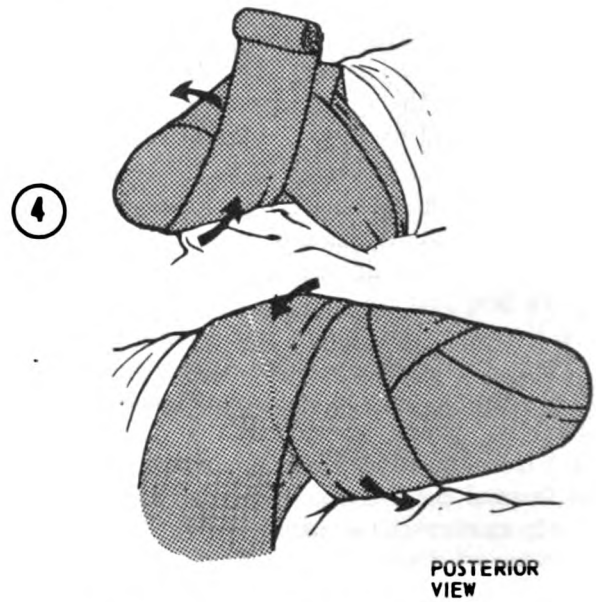


POSTERIOR VIEW

FOLLOWING THE ENCIRCLING TURN AROUND THE PELVIS, BRING THE BANDAGE DIAGONALLY, LATERALLY, AND POSTERIORLY AROUND THE PROXIMAL STUMP AND UP HIGH INTO THE ADDUCTOR AREA MEDIALLY. CONTINUE UPWARD OVER THE ANTERIOR ILIAC CREST AND POSTERIORLY AROUND THE PELVIS.

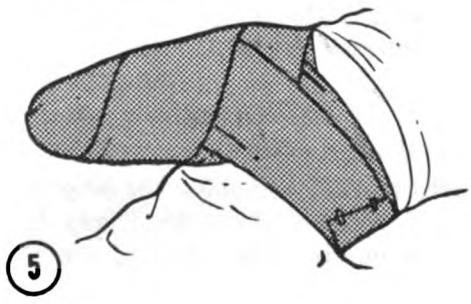


START THE SECOND BANDAGE SLIGHTLY LATERAL TO THE FIRST, PROCEED DIAGONALLY AND LATERALLY TO COVER THE DISTAL LATERAL CORNER WHICH WAS LEFT EXPOSED ON PREVIOUS TURNS. CONTINUE AROUND DISTAL END TO ANTERIOR ASPECT AND OBLIQUELY UPWARD TO THE ANTERIOR ILIAC CREST AND AROUND THE PELVIS.



POSTERIOR VIEW

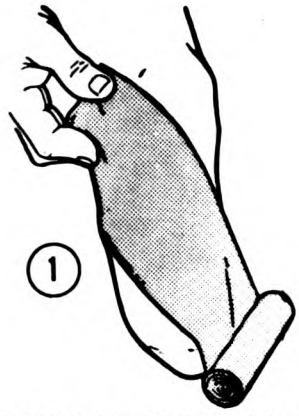
CONTINUE WITH FIGURE-OF-EIGHT TURNS, WITH PRESSURE EXERTED DISTALLY AND GOOD COVERAGE IN THE GROIN TO PREVENT ADDUCTOR ROLL.



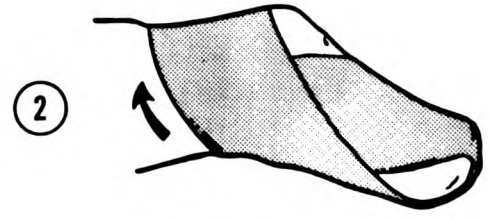
COMPLETED BANDAGE.

(A) RIGHT ABOVE KNEE (A/K)

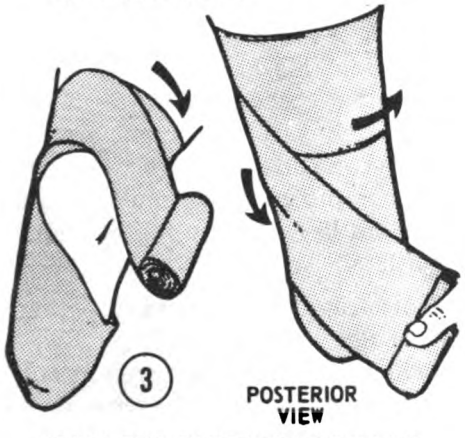
Figure 5-100. Stump bandaging.



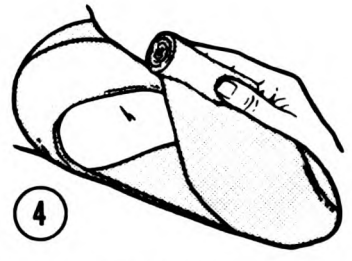
START FIRST BANDAGE PROXIMAL TO THE LATERAL FEMORAL CONDYLE AND PROCEED DIAGONALLY ACROSS THE ANTERIOR ASPECT OF THE STUMP.



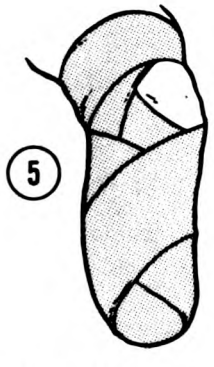
CIRCLE AROUND THE DISTAL PORTION OF THE STUMP AND CONTINUE DIAGONALLY ACROSS THE POSTERIOR ASPECT TO ANCHOR THE END OF THE BANDAGE. ENCIRCLE THE KNEE PROXIMAL TO THE PATELLA, AVOIDING A CONSTRICTING TURN.



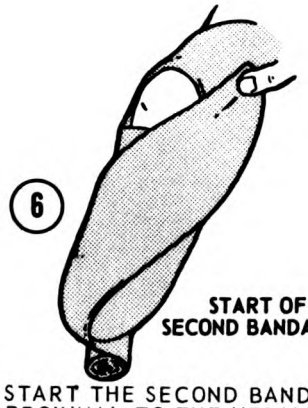
BRING THE BANDAGE MEDIALLY OVER THE MEDIAL TIBIAL CONDYLE AND DIAGONALLY ACROSS THE POSTERIOR ASPECT OF THE STUMP.



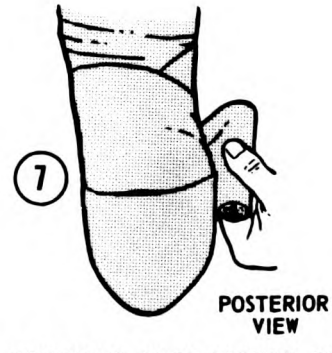
COVER THE LATERAL DISTAL CORNER OF THE STUMP AND PROCEED UPWARD DIAGONALLY ACROSS THE MEDIAL TIBIAL CONDYLE TO ENCIRCLE THE PROXIMAL KNEE AREA AGAIN.



CONTINUE WITH FIGURE-OF-EIGHT TURNS, LEAVING THE PATELLA EXPOSED.



START THE SECOND BANDAGE PROXIMAL TO THE MEDIAL FEMORAL CONDYLE AND PROCEED DIAGONALLY ACROSS THE TIBIA TO THE LATERAL CORNER OF THE STUMP.



CONTINUE WITH FIGURE-OF-EIGHT TURNS, EXERTING PRESSURE DISTALLY AND AVOIDING CONSTRICTION PROXIMALLY.

(B) RIGHT BELOW KNEE (B/K)

Figure 5-100—Continued.

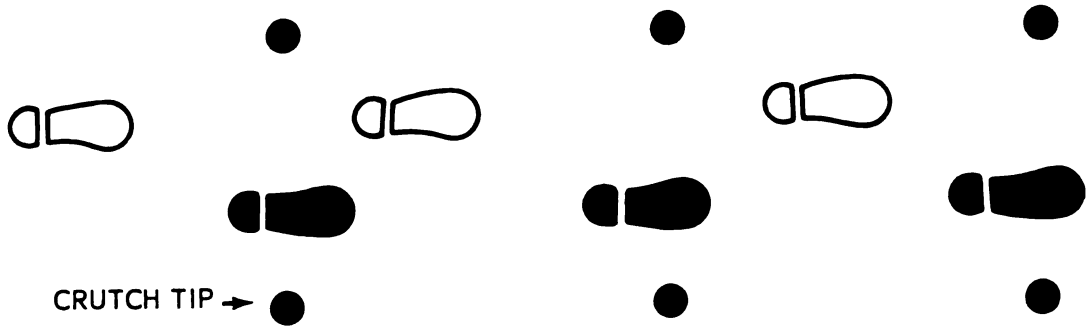


Figure 5-101. The 3-point gait.

inches. Adjust the crutch shaft to this measurement.

3. Ask the patient to place his arm over the crutch and grasp the handbar so that his elbow is in approximately 30 degrees flexion and the palm of his hand is flat on the handbar. Adjust the handbar if necessary.

Teaching Use of Crutches for "3-Point" Gait

1. Be sure a shoe is worn on the unaffected foot.
2. Be sure the crutches have rubber tips in good condition.
3. Assist the patient to stand upright, bearing weight on his good leg.
4. In standing position, place the crutch tips about 6 inches ahead and to the side of the toes. This 3-point contact with the floor is the tripod position (fig. 5-102).
5. Tell the patient to lean forward slightly and to shift his weight to his hands. He should practice shifting his weight to his hands and then back to his good leg before attempting to swing his body to a position just ahead of the crutches.
6. Check to make sure his weight is borne on the palms of his hand, not by leaning the axillae on the crutches. Paralysis of the radial nerve ("crutch paralysis") may result if weight is borne in the axillae. When crutches are properly adjusted, you should be able to slip two fingers between the top of the crutch and the patient's axilla.
7. Encourage the patient to take short swing-through steps, landing just beyond the crutches. In this way, weight is shifted back to the good leg and the crutches are then advanced to tripod position in preparation for the next step.
8. Stand in back of the patient when he is learning to use crutches. If he begins to fall, grasp his waist and support his weight against your body.
9. Remind him to check the way ahead to see that there are no wet or slippery places and no obstacles, and then to walk with head erect.

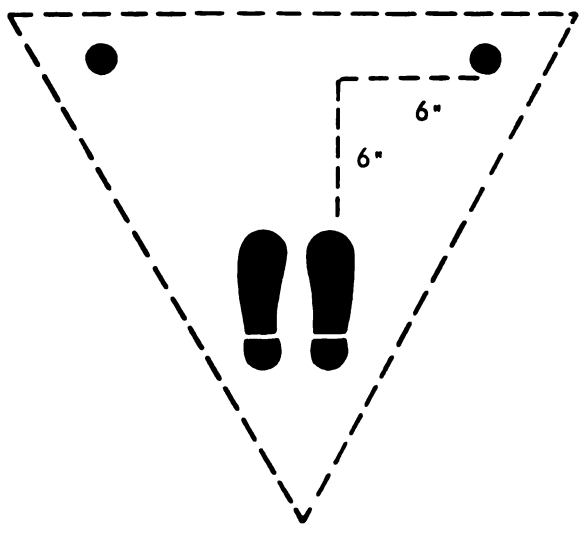


Figure 5-102. Standing position (tripod).

5-129. Use of Turning Frames

a. General. Turning frames are devices used to provide immobilization and to facilitate nursing care for the patient who, while immobilized, needs frequent changing from supine to prone position. A turning frame is used in the treatment of patients with such conditions as extensive burns, spinal and pelvic fractures, tuberculosis of the spine (Pott's disease), and spinal cord injury. The use of a frame is so important in the initial medical care of a cord-injury patient that improvised frames fashioned from standard canvas litters are used under combat conditions when commercially manufactured frames are not available. The

major advantages in the use of a frame are to prevent complications such as—

(1) *Pressure sores.* With relief of pressure from body weight on pressure areas (fig. 5–24), the blood supply to the skin is improved. Larger body areas are also exposed for complete skin care.

(2) *Respiratory congestion.* Rotation of the patient to face-down position aids gravity in loosening and ridding the lungs of fluid accumulations. The patient can cough and expectorate more effectively in prone position.

(3) *Kidney and bladder complications.* Rotation of the patient aids gravity in the elimination or urine sediments (heavy waste materials that may form kidney or bladder stones).

b. Types of Frames.

(1) The Foster reversible orthopedic bed and the Stryker turning frame are commonly used. Both are double frames which are rotated on the longitudinal (side-to-side) axis. Their operation is similar in principle, with variations in the details of preparing the frame for use and in the turning method; *for example,* the Foster bed can be adjusted for hyperextension, while the Stryker frame requires separate hyperextension frames.

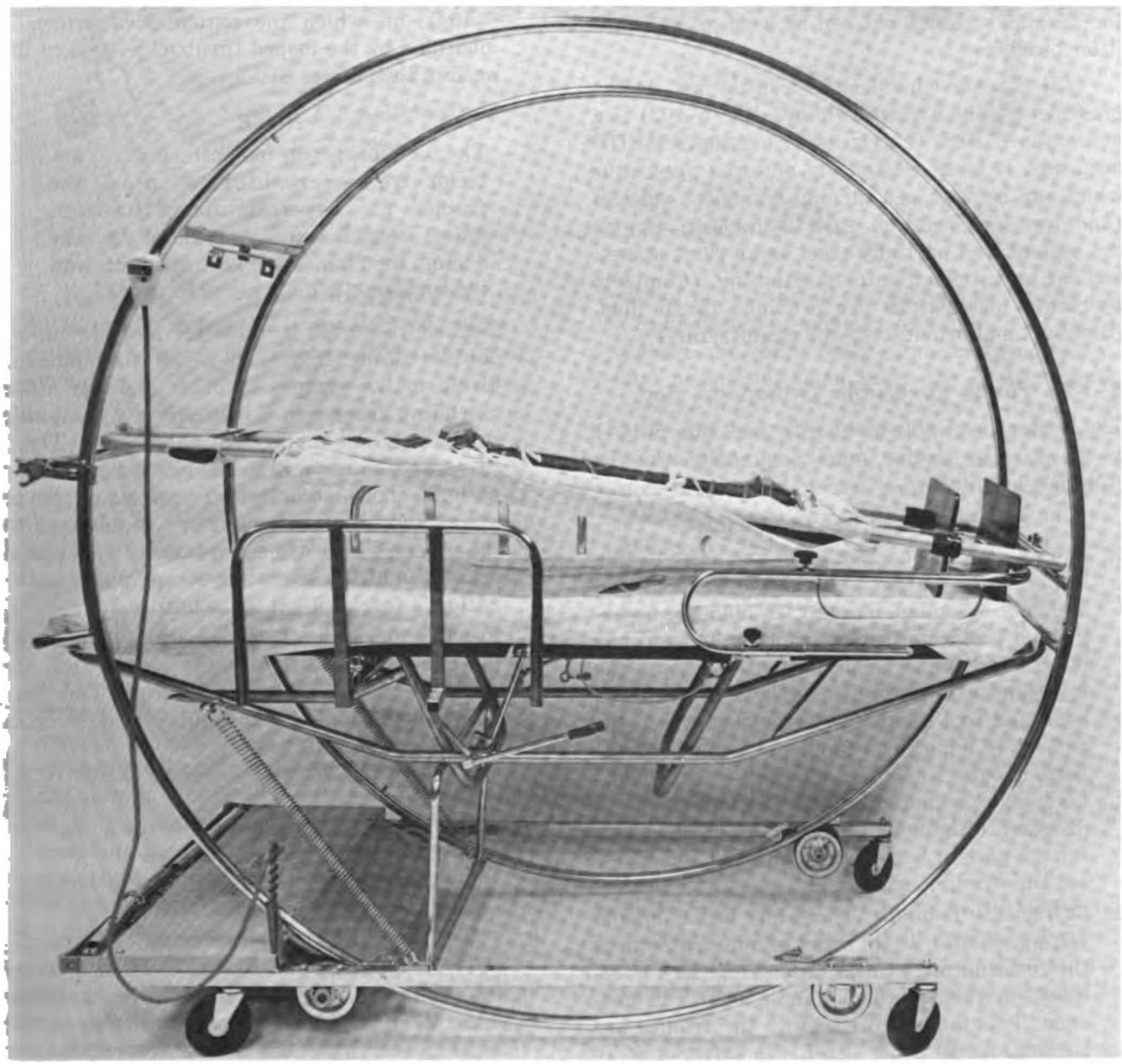


Figure 5–103. CircOlectric bed.

As for similarities, both have a rotary-bearing turning apparatus at each end and, when traction is used, it can be maintained during the turning process, and both can be elevated at either the foot or head end by extending the legs of the frame and inserting lockpins in holes at the selected height. The patient is sandwiched in between two canvas-covered frames when he is turned. The frame on which he lies prone is the anterior frame; the one on which he lies supine is the posterior frame.

(2) Improvised litter frames. Two canvas litters, padded with smoothly folded Army blankets are prepared for use as an anterior and a posterior frame. The frames are placed on sawhorses for greater stability but can be used on standard litter brackets.

(3) Stryker CircOlectric hospital bed. At the present time the CircOlectric bed (fig. 5–103) is a nonstardard item that is used in some AMEDD hospitals. It is an electrically powered apparatus which can be used as a turning frame for vertical (end-over-end) rotation, as a tilt table to support the patient in a partially erect or an erect stance, and for unrestricted gatch positioning. (Complete operating instructions are provided in an illustrated manual provided by the manufacturer.)

5–130. Foster Reversible Orthopedic Bed

The Foster reversible orthopedic bed (fig. 5–104) is the turning device most commonly used in AMEDD hospitals.

IDENTIFICATION OF PARTS

1. *Frame locking bars.* There are four frame locking bars (A, fig. 5–104), two in each head and foot assembly. These bars hold the anterior and posterior frames in place. The top bar is removed at the head and foot to release the top frame after turning. The bottom bar at the head and foot secures the frame on which the patient is lying. You must never pull out the bottom bars when the frame is in use. Mistakes have occurred, and the patient has been dropped to the floor because the person caring for the patient has become confused and pulled out the wrong locking bar.
2. *Safety lock T-handle.* The safety lock T-handle (B, fig. 5–104) at the head of the bed secures the rotating mechanism. The safety lock is released by turning the T-handle until it is loosened. This is done just before the frames are rotated. At all other times, the safety lock T-handle must be tight.
3. *Posterior Frame.* The posterior frame (C, fig. 5–104), on which the patient lies supine, is identified by the straight rod turnbuckle toward the head end of the frame. Two long canvas sections are laced in place, leaving a 4- to 6-inch opening between these two sections for the bedpan. A canvas strap is always buckled in place to keep the buttocks from sagging through the opening; this strap is removed only for times when the patient uses the bedpan or for skin care. Note placement of the bedpan holder in D, figure 5–104. The deep end is always toward the foot; otherwise the bedpan cannot be slipped in place.
4. *Anterior frame.* The anterior frame (E, fig. 5–104), on which the patient lies prone, is identified by the looped turnbuckle toward the head of the frame.

NOTE

The turnbuckles on the posterior and anterior frames are used to adjust the frames for hyperextension. However, unless this feature is ordered by the doctor, the frames are kept straight, and the turnbuckles must never be turned.

Two short canvas sections are laced in place: one extending from just below the shoulder girdle to the symphysis pubis and the other extending from 4 to 6 inches below the pubis to the internal malleoli of the ankles. These two covers must be adjusted to conform to the patient's body structure. Two canvas straps are used on the anterior frame in addition to the covers. The broad strap covers the perineal opening and the narrower strap supports the patient's forehead—it is the headrest.

5. *Traction bar.* The T-shaped traction bar (F, fig. 5–104) at the foot of the bed is used for pelvic and lower-extremity traction. The traction ropes leading to the pulley and weights are attached to this bar.

NOTE

When cervical traction is needed, the traction rope is passed through the rotary mechanism at the head of the bed, and no traction bar is used.

6. *Traction pulley.* A traction pulley (G, fig. 5-104), at the head and foot of the bed receives the rope passed through the rotating mechanisms, which maintain constant traction at the head or foot when the frames are rotated.
7. *Leg lockpins.* Leg lockpins (H, fig. 5-104

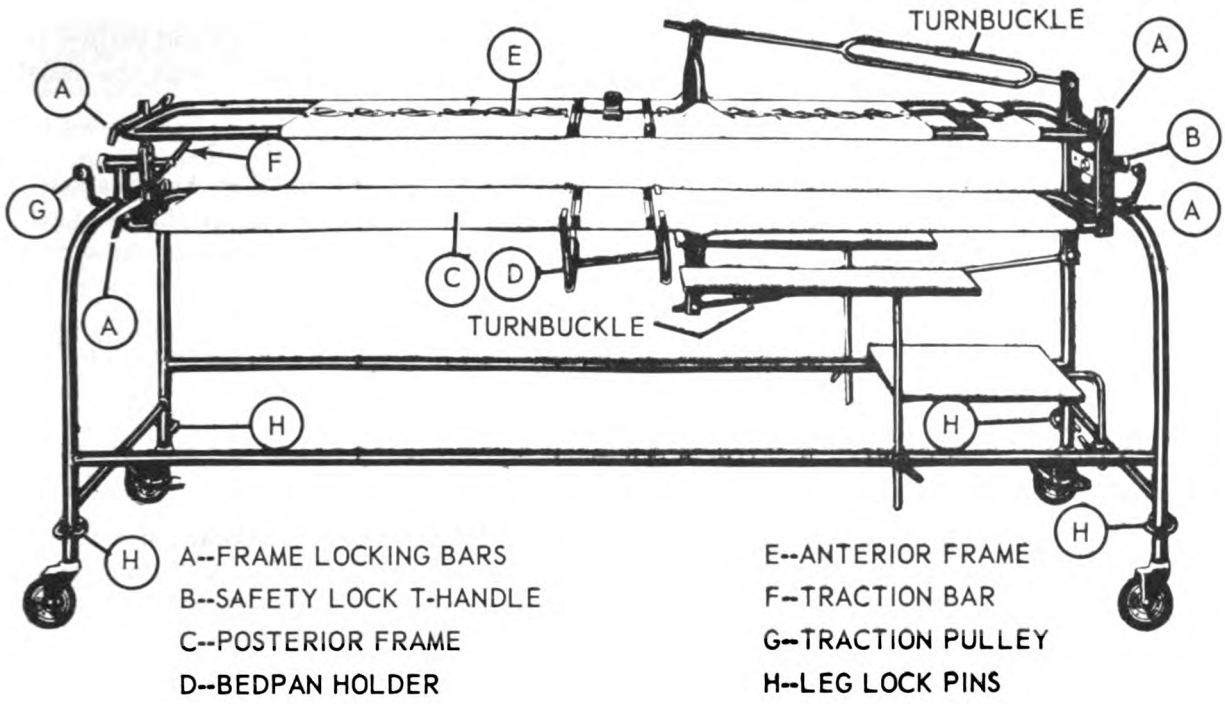


Figure 5–104. Foster reversible orthopedic bed.

secure the legs in extended position when the head or foot of the bed is elevated for countertraction, or when elevation is needed for other purposes.

8. *Accessories.* The arm boards and the utility tray fit into slots and can be swiveled into desired positions, raised, and lowered. A footrest (not illustrated) is also used; it is clamped to the posterior frame at the level required to support the patient's feet at a right angle.

NOTE

When the patient lies prone, if the anterior cover section has been applied to the frame properly, his feet will hang free, perpendicular to the floor. Thus, with proper positioning on either frame, plantar flexion (foot drop) can be prevented. It is important to note that with adjustment of the arm boards, effective support and range of motion of the shoulders and arms can also be provided. (Appendix B illustrates the range of motion of extremities.)

9. *Frame padding.* Foam rubber padding and contoured bedsheets may be available for use on both anterior and posterior frames. In most AMEDD hospitals, bed pillows are substituted for the commercial frame pads and sheets. The use of pillows has several advantages: pillows can be fluffed up and aerated, individual soiled pillows and soiled cases can be changed easily, and no special linen exchange arrangements need be made with the laundry. Four to five pillows for each anterior and posterior frame are required, and one or more pillows for each arm board. The pillows temporarily not in use must be stored neatly at the bedside and reserved for individual use of the patient. Bedside pillow storage can be a problem; one answer is to place boards across the side rails of the base of the frame to form a platform on which the pillows are stacked.

TURNING THE PATIENT ON THE FOSTER BED

The doctor will order the interval between turnings, and turning must take place at the scheduled interval both day and night. The usual policy in AMEDD hospitals specifies:

1. Two persons will assist with each turning, one at the head and one at the foot of the frame.
2. Three restraining straps will normally be used around both frames when the frames are turned, one at the level of the knees, one at the hips, and one at the elbows.
3. No pajamas will be worn by the patient—this allows maximum skin exposure, and no manipulations are needed in putting pajamas on and

taking them off. A loin cloth (hand towel) is draped over the genitalia, and a woman patient also has a towel placed over the breast. Undue exposure must be avoided.

Procedure (Supine to Prone)

1. Tell the patient what is to be done.
2. Lock wheels.
3. Clamp and detach drainage tubes, if in use.

NOTE

If a urinary catheter, use aseptic technique. Place the catheter between the thighs where it will be accessible through the perineal opening of the anterior frame when he has been turned. Place the detached end of the urinary drainage tube in a fold of sterile towel on the utility shelf, making sure the free end is above the drainage bottle to prevent siphonage.

4. Remove the foot support. Lower the arm supports, and swivel them under the frame.
5. Place the patient's arms in extension at his side. If his arms are paralyzed, place his hands slightly under the thighs to prevent dangling off the frame.
6. Remove any covering sheet, with no undue exposure.
7. Place wrinkle-free pillows crosswise on the patient, overlapping edges, from chin to pubis and from below genitalia to ankles.
   a. If foam-padded frames are used, place pillows across the knees to hold legs snugly in place when turning.
   b. If the patient has a tracheotomy, place the first two pillows to form a V-neckline to assure a clear airway.
8. Place the anterior frame over the patient, lowering the head end first so that it is snug but with no undue pressure. Ask the patient how it feels.
   a. Aline the locking slot on the head end of the frame to the appropriate hole in the head assembly.
   b. Slide the locking bar through the hole, the slot, and the hole on the opposite side. Check to see that the hinged end of the locking bar is angled down (toward the floor) when the bar is in place.
   c. Lock the foot end in a similar manner, checking to see that the foot slot is alined to the same hole as the head slot.

NOTE

The assistant at the foot end verifies the slot and hole alinement with the assistant at the head end.

9. Secure restraining straps.
10. Warn the patient that he is about to be turned. The specialist at the head end tells the patient and his assistant the direction of turn ("left" or "right" designates the patient's left or right side).
11. Have the specialist at the head end loosen the T-lock handle and give the signal to the assistant at the foot end. Both turn the frame quickly and smoothly to prone position.

NOTE

When turning the frame must be a 1-man operation, with no assistant available, loosen the T-lock handle while holding the frame steady. Then stand near the head end at the side of the frame and rotate the frame toward you.

12. Have the specialist at the head end reset the T-lock handle. Test the bottom frame by attempting to rock it back and forth. It should be firmly positioned.
13. Remove locking bars from TOP frame.
14. As the bars are removed, slip each one through the loop of the corresponding bottom bar to avoid mislaying one. If a bar is lost, the frame cannot be secured for turning.
15. Remove the top frame, placing it upright against the nearest wall.
16. Remove the pillows on which the patient was lying.
17. Using aseptic technique, reconnect drainage tubing. Release all drainage clamps.
18. Adjust padded perineal strap, making sure there is no constriction of the catheter if one is used.
19. Adjust forehead, arm, and foot supports for comfort and body alinement.
   a. Adjust forehead strap so that there is no pressure on eyes.
   b. Check to make sure there is no pressure on the throat from the top cover of the anterior frame.
   c. Pivot arm rests, elevate them, and adjust pillows on them to support the arms, shoulders, wrists, and hands in a position of function. The arms may be placed in abduction with forearms in flexion, or al-

ternately, in extension. (Appendix B illustrates joint movements of arms and shoulders.)

d. Elevate the lower legs slightly by placing a small pillow or pad under the shins so that the knees are in slight flexion and the feet hang perpendicular to the floor, with no pressure on the dorsum of the feet.

20. Give the patient back care from the top of the head to the soles of the feet, with special attention to the back of the head, the back edges of the ears, and all bony prominences of the trunk and extremities. Report any evidence of pressure sores immediately.
21. Swivel the utility tray in reach of the patient's hands. He can use the tray when he is in prone position and has use of his arms and hands for many purposes—feeding himself, reading, shaving, tooth brushing, etc. Be sure the tray is clean, dust free and secured by the lockpin.
22. Check posterior frame, making sure the canvas is taut and clean. Replace canvas p.r.n.
23. Replace any soiled pillowcases. Fluff and aerate pillows and stack neatly on a platform made on the bedrails, or on a chair.
24. Store turning straps in designated place—looped to the frame or rolled and placed in the bedside stand. Do not mislay the straps.

Procedure (Prone to Supine)

1. To turn from prone to supine follow procedure for turning from supine to prone, steps 1 through 17, with these exceptions to step 7—
   a. When pillow padding is used, overlap edges from head to heels, arranging an overlap at buttocks level so that space can be made p.r.n. for using bedpan and for cleansing.
   b. Follow local instructions for placement of small pillow or pad at cervical and lumbar areas (fig. 5–105)—remember that when the patient is supine, these two areas may need additional support. Placement of supports before turning will prevent sagging.
2. Check body alinement when in supine position.
   a. Adjust buttocks strap so that buttocks do not sag through the bedpan opening.
   b. Check alinement of hips and thighs to avoid either external or internal rotation at the hips. Separate thighs slightly, using towel roll p.r.n. on either side of each thigh for support.
   c. Adjust leg pillows so that the heels are free of pressure.
   d. Place a small pad under the knees to provide slight knee flexion.
   e. Place footrest to support feet at a right angle, separate ankles, using a small pad between ankles and a towel roll or sandbag on either side to prevent inversion or eversion.
   f. Adjust arm boards and pillow supports to provide prescribed range of motion and position of function for shoulders, arms, wrists, and hands.
3. Give skin care with special attention to all bony prominences—clavicles, hip bones, and knees. Note any signs of pressure and report them immediately.
4. Check perineal area. Cleanse genitalia p.r.n. If indwelling catheter is present, check its position and note free drainage in connector.

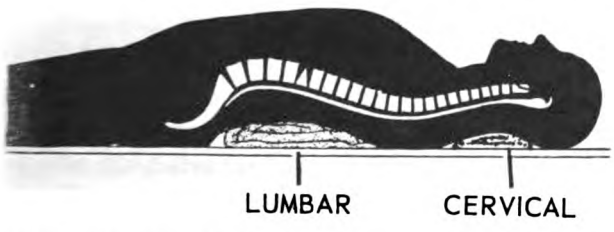


Figure 5–105. Effects of pads to support lumbar and cervical areas.

5–131. Stryker Turning Frame

The Stryker turning frame (fig. 5–106) is commonly used when transporting patients between hospital treatment facilities. It is also used in hospital wards. The turning frame rests on a wheeled cart base. The frame is lifted off the cart when necessary for loading and unloading operations during transportation.

IDENTIFICATION OF PARTS

1. *Cart.* The wheels of the cart (A, fig. 5–106) can be locked and the legs elevated for traction at head or foot. The support runners of the frame are locked in place with a wing-nut bolt so that the frame rests securely on the cart. The utility tray (fig. 5–106) slides on the cart base to the desired place for use.
2. *Locking pin.* Two round locking pins (B, fig. 5–106) at the head and at the foot of the Stryker frame release the rotating mechanism.

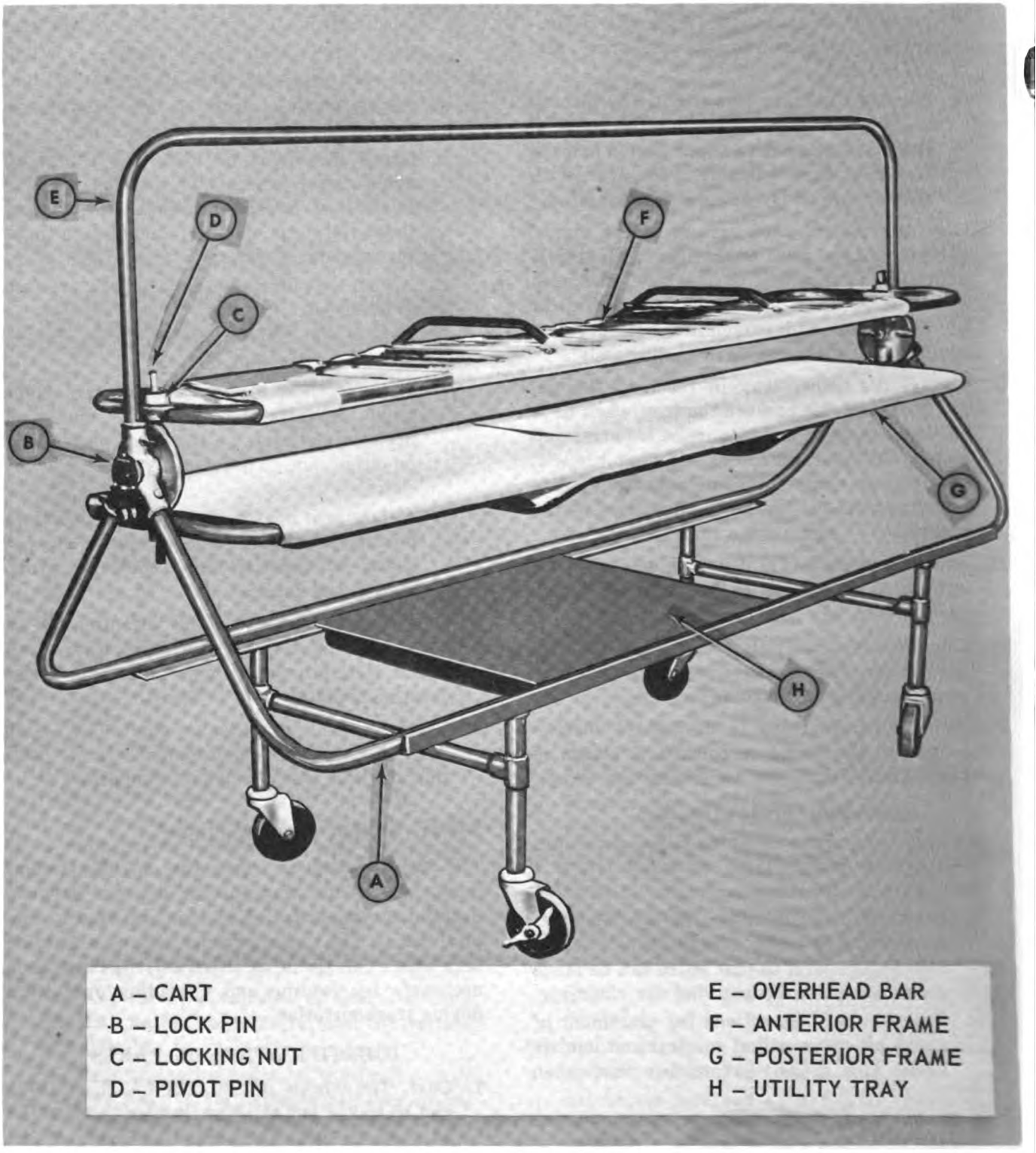


Figure 5–106. Stryker turning frame.

Pull them out for turning; they will re-engage automatically when the frame is turned. Always check to see that both ends are locked by rocking the frame slightly. Do not use the frame if the locking pin cannot be re-engaged.

3. *Locking nuts.* Four round, knurled, screw nuts (C, fig. 5–106) fit onto the 4 pivot pins (D, fig. 5–106) of the head and foot turning assembly. When in use, the locking nuts hold the anterior and posterior frames together for turning and

secure the frame on the pivot pins. If a nut is lost or misplaced, the frame cannot be used.

CAUTION

When you remove a locking nut, hold it in your hand and, as soon as the frame is lifted off the patient, replace the nut on the pivot pin.

4. *Overhead bar.* This bar (E, fig. 5–106) is detachable and is removed when the patient is first lifted onto the frame. It can be used to drape top covers as with a bed cradle. A patient who is permitted to lift himself can also grasp the bar as he would a trapeze.
5. *Anterior frame.* This is the frame (F, fig. 5–106) on which the patient lies face down. It is fitted with a 1-piece canvas cover that has a round perineal opening. The length of the anterior canvas is adjusted on the frame to conform to the patient's dimensions: from shoulder girdle to perineal opening and from perineal opening to internal malleoli of the ankles. The canvas is kept taut by hooks and tension straps. A face piece (not illustrated) or a canvas strap is used on the anterior frame for a headrest.
6. *Posterior frame* (G, fig. 5–106). This is the frame on which the patient lies face up. It is fitted with a 2-piece canvas cover and a canvas buttocks strap.
7. *Accessories* (not illustrated). Arm boards fit into slots on the runners and cart base, and a footrest clamps to the posterior frame. Foam rubber padding and contoured sheets may be available, or pillow padding may be used as with the Foster reversible bed.

PROCEDURE FOR OPERATING THE STRYKER FRAME

Follow procedure as for the Foster reversible bed (para 5–130) with these exceptions—

1. The operators at the head and the foot of the frame remove the top knurled locking nut from the head and the foot pivot pins. Each operator holds the locking nut in his hand until it is replaced on the pivot pin.
2. The frame to which the patient is to be turned is placed over the patient, fitting the holes at the head and the foot of the frame on the pivot pins.
3. The knurled locking nuts are screwed on the pivot pins, securing first the head end and then the foot end.
4. The restraining straps are fastened and the patient and assistant are instructed on the direction of the move.
5. The locking pins at the head and at the foot of the frame are pulled out and the frame rocked slightly to make sure both are disengaged.
6. The patient is turned. The locking pins should both snap back into place when the turn is completed. Frame can be tested by attempting to rock it slightly.
7. The straps are unfastened and removed from the top frame by unscrewing the TOP knurled locking nuts at the head and foot. Nuts on the pivot pins are replaced immediately.

5–132. Improvised Field Litter Frames

(fig. 5–107)

a. Anterior Frame. This is the frame on which the patient lies face down. Two holes are cut in the canvas—one for the face and a small central one for a urinary catheter drainage tube. Folded blankets are used to pad the litter. Holes punched in the blanket are laced with bandage on the underside to provide a smooth, firm, wrinkle free surface. Holes corresponding to the litter face and catheter holes are cut in the blanket and the openings are heavily taped for reinforcement. ABD pads secured around the holes provide extra comfort and protection.

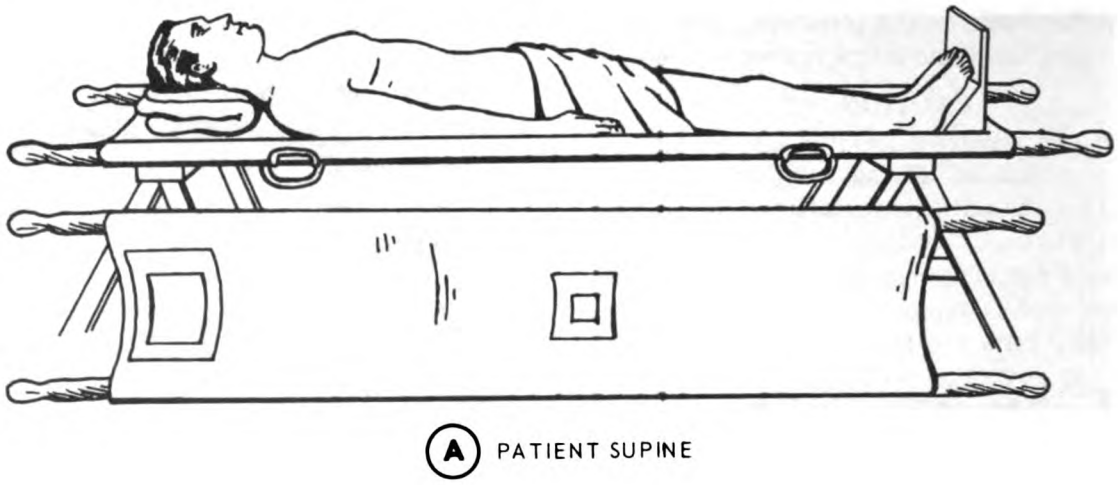
IMPORTANT NOTE

Holes must correspond to the face and genitalia of the patient for whom the frames are prepared.

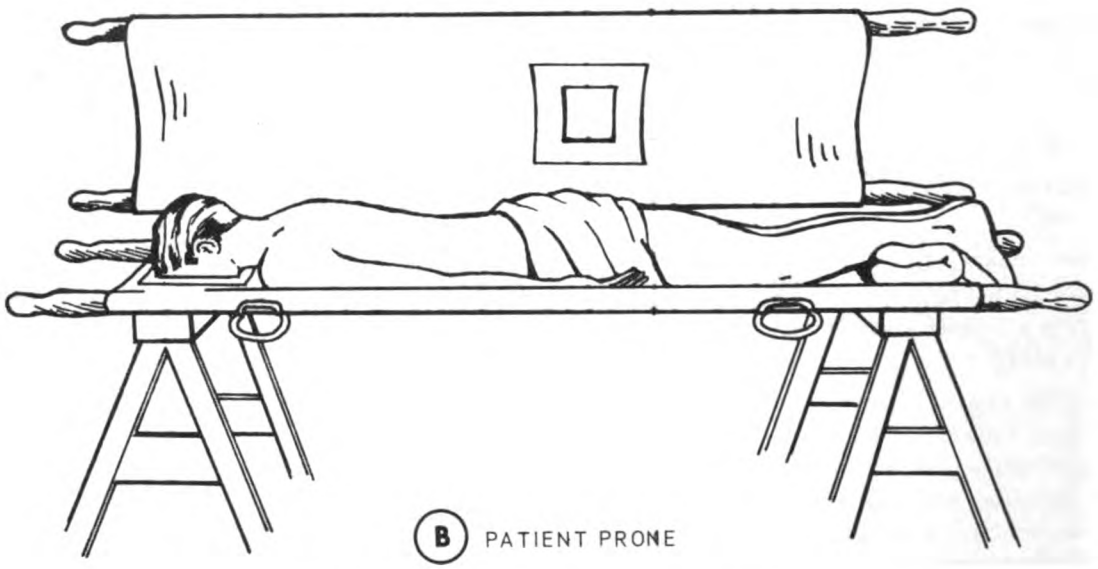
b. Posterior Frame. This is the frame on which the patient lies face up. One hole for use of a bedpan may be cut in the litter. When this is done, the canvas must be heavily taped for reinforcement to avoid tearing from the weight of the body. The blanket padding also has only one hole cut for the bedpan, and a thickly padded strap must be available for use to keep the buttocks from sagging through the opening when the bedpan is not in use.

c. Footboard. A padded right-angle footboard must be used when the patient is supine, to support the feet in neutral position. Any available box of suitable size is an appropriate footboard.

d. Turning Straps. Two webbed straps are used to hold the two frames together when turned. The turning straps are placed at the knees and at the chest.



(A) PATIENT SUPINE



(B) PATIENT PRONE

Figure 5-107. Improvised field litter frames.

TO TRANSFER THE PATIENT TO THE LITTER FRAME

1. Keep the patient supine on the original litter on which he has been transported to the medical treatment facility—do not attempt to move the patient from this litter until the improvised turning frame has been prepared.
2. Elevate the litter (with the patient lying on it) on a pair of sturdy boxes—one at the head and one at the foot of the litter—or on a pair of sawhorses. The boxes or sawhorses provide steadier base than the field litter brackets.
3. While the patient is supine, slit all clothing along seams and expose the anterior body surface. Use a towel drape over genitalia.
4. Place the patient's arms in extension, with fingers slightly under each thigh. If pillows are available, place two of them crosswise over his legs from knees to ankles. If pillows are not available, use extra folded blankets. This leg padding keeps the limbs from sliding when the frame is turned.
5. Place the prepared anterior frame gently over the patient, alining face and perineal opening to the patient.
6. Strap the anterior frame and the original transport litter together, sandwiching the patient between them. Apply the straps snugly and securely at chest and knee level.
7. Tell the patient that you intend to turn him so

that he will be face down on the padded litter frame.

TURNING

1. Both operators must be in agreement on the placement of their hands in order to coordinate the turn. Both must understand that the operator at the head of the frame will give instructions and that the turn to left or right is in accordance with the head operator's left or right.
2. Both operators cross hands and place the top hand on the same side of the top litter and place the bottom hand on the same side of the bottom litter. The hand on top is the direction of turn.
3. With hands in position, palm up, both operators grasp the litter handles firmly. On signal, both lift, turn, and lower the frame back onto the frame support.

CAUTION

Be sure the patient's face is not lowered onto the support; the head operator must check for this.

4. With the turned frame securely resting on the supports, remove turning straps. Lift off the unpadded litter. The prepared padded litter (posterior frame) will be used in all subsequent turns.
5. Remove all clothing by lifting it off the patient, slitting it along seams when necessary to avoid unnecessary movement of the patient.
6. With the patient prone and his back fully exposed, make initial examination of the patient's posterior body surface.

Routine Positioning

Whether prone or supine, the patient must be positioned so that arms, hands, legs, and feet are in a position of function.

- *Arm position.* Position arms at sides in extension, or alternately, in abduction, with forearms in flexion and hands at shoulder level or slightly above the shoulders. The hands and wrists may be supported in a position of function by placing a bandage roll in each palm and curling the fingers and thumb around the roll to grasp it.
- *Leg position.* Prevent internal or external rotation at the hips by rolled blankets placed parallel to thighs and between legs from groin to ankles. Separate ankles with folded towel pads. When supine, place a small pad under the Achilles tendon to elevate the heels and a small pad just distal to the popliteal space to keep the knees in slight flexion. With the padded right-angle footboard in place, keep both feet in neutral position (toes pointing upward). When prone, place a folded blanket or small pillow, if available, beneath the lower legs to keep the knees in slight flexion and the feet hanging free and perpendicular to the floor. There should be no pressure on the dorsum of the feet or on the toes.

Routine Turning

1. Schedule turning q.2 h., day and night.
2. Using aseptic technique, disconnect the urinary drainage catheter if one is in use, placing the clamped catheter between the thighs for immediate accessibility through the perineal opening.
3. Remove footrest, supporting pads, and blanket rolls.
4. Place arms in extension with fingers slightly under thighs.
5. Pad lower legs with blankets or pillows.
6. Aline top frame openings to the patient.
7. Secure turning straps at chest and knee.
8. Tell the patient to which side he is being turned.
9. Turn the patient. Remember, with hands crossed, the top hand is direction of turn.
10. When the patient is turned—
    a. Using aseptic technique, reconnect catheter if in use.
    b. Check alinement and position of all extremities.
    c. Give skin care, from top of head to heels.

CAUTION

Use gentle circular movements in bathing and massaging bony prominences and pressure points. Report any evidence of pressure immediately.

11. Check all frame openings for any pressure on body areas, constriction of body tissue, or constriction of tubing.
12. Check for firm, snug placement of buttocks strap when in supine position to avoid any sagging of the body through the bedpan opening.

NOTE

Place the bedpan on a box beneath the bedpan opening when one is used.

Section XII. ASSISTING WITH DIAGNOSTIC TESTS AND COLLECTIONS OF SPECIMENS

5-133. General

a. Diagnostic tests and examinations are conducted by order of the medical officer to help him determine the nature of a specific disease condition. Many of these tests or examinations may be repeated at intervals to determine the patient's progress or response to prescribed treatment. While some are performed on the ward, in the dispensary, or in the outpatient clinic, many others are conducted only in special laboratories and hospital clinics. The examination or test may require any of the following, alone or in combination:

(1) Collection of a specimen of body excretion, secretion, vascular fluid (*for example,* blood), extravascular fluid (*for example,* cerebrospinal fluid), or tissue by biopsy for laboratory examination.

(2) Visual examination of a body cavity or organ by means of an endoscopic instrument (*for example,* bronchoscopy or cystoscopy) or by roentgenologic (X-ray) examination.

(3) Monitoring and recording of electrical impulses produced by activity of the heart muscle or brain as in electrocardiography (ECG) and electroencephalography (EEG).

(4) Observing and measuring organ functions and biologic processes by administration of radioisotope material.

b. The medical specialist's role in assisting with diagnostic tests and collection of specimens will vary, depending upon the test, the specimen, the condition of the patient, and the local situation and policy. Although he may seldom perform any part of the test himself, he should be acquainted with those commonly performed in order to give intelligent patient care and appropriate assistance to the doctor, nurse, or technician. In general, the medical specialist should know—

(1) How and why the procedure is done and what, if any, reaction is expected from it.

(2) What explanation and physical care the patient should have before, during, and after the procedure. The informed, prepared patient is more apt to cooperate and to tolerate any inconvenience or discomfort incidental to the test.

(3) What equipment, clean or sterile, must be provided when he assists with the procedure and how to care for used equipment following the procedure.

(4) What his role as an assistant is in relation to that of the doctor, nurse, or technician performing the test.

(5) What his responsibility is in collecting and handling specimens and safeguarding reports received on laboratory examination of specimens.

5-134. Nursing Care and Observations When Assisting With Diagnostic Tests

a. General Preparatory Measures for Procedures Performed Off the Ward. Procedures vary from one hospital to another concerning ward preparation of patients who are to be sent or escorted to clinics, laboratories, radiology, or operating rooms. These various departments set up their own standard operating procedure in accordance with local directives and issue a set of instructions to the wards. These instructions and the doctor's orders for the particular patient must be checked and carried out carefully to insure the best results for the patient. A few general rules to remember are the following:

(1) *Prepare the patient mentally.* Tell the patient briefly what to expect and explain his role in the preparation. Mental preparation of the patient gives him emotional security and gains his confidence and cooperation.

CAUTION

Always verify with the nurse or doctor what information you may give to the patient.

(2) *Prepare the patient physically.* Have the patient clean, properly dressed, and protected from exposure or drafts. Make sure that any specific preparation ordered has been accomplished, such as a cleansing enema, medication, rest for a required period, or restriction on food or liquids.

(3) *Have the right patient in the right place at the right time.* If he is an ambulatory patient, give him specific directions how to reach the clinic or laboratory. Transport an otherwise ambulatory patient who has received a sedative or other pretreatment medication in a wheelchair or on a stretcher. The responsibility of ward personnel accompanying the patient ends only after the patient is placed in the care of the personnel who are to perform the procedure.

(4) *Be sure that forms are signed.* Insure that SF 522 (Clinical Record—Authorization for

Administration of Anesthesia and for Performance of Operations and Other Procedures), if required, is signed by the patient or the patient's sponsor and witnessed by a medical officer, nurse, or other suitable individual (AR 40–2).

(5) *Send the patient's clinical record and X-rays to the off-ward examination area.* Inclose the record in a sealed manila envelope to safeguard the contents. Check to see that the records are returned with the patient.

b. General Nursing Care During Diagnostic Procedures Performed On the Ward. In addition to following the general rules in *a* above, you should—

(1) Assist the medical officer as required. This may involve obtaining equipment, opening sterile trays, preparing a sterile field, pouring solutions, preparing the patient's skin, positioning the patient, draping the patient, and assisting the medical officer in the performance of the procedure.

(2) Reassure the patient and make him as comfortable as possible.

NOTE

For some patients and some procedures, two assistants will be needed—one to support and observe the patient and one to assist the doctor.

(3) If a specimen is taken, attach to the specimen container a prepared label identifying the patient by name and register number, ward, date, and test. Forward the specimen to the laboratory immediately with a properly executed SF 514 (Clinical Record—Laboratory Reports) of the proper series or SF 515 (Clinical Record—Tissue Examination), which is usually required for any biopsy specimen.

c. General Nursing Care Following Diagnostic Procedures.

(1) Return the patient to his bed by the means ordered.

(2) Check the orders of the medical officer who performed the procedure, and observe and report any unusual reactions of the patient. If there are no orders pertaining to taking vital signs, accomplish this nursing measure according to standard ward procedures.

(3) Use appropriate measures to relieve discomfort or pain.

(4) If the patient has been sedated or anesthetized, insure bed rest until he has completely reacted. Tell him to stay in bed and to signal for any needs. Use side rails according to standard ward procedures.

(5) If the procedure involves the patient's diet, notify food service to serve, modify, or cancel his meal as appropriate.

(6) Explain to the patient that he will be notified when he may resume his normal regime. When this time arrives, inform him promptly.

(7) Record the following information on DD Form 640 (Nursing Notes):

- Date and time.
- Type of procedure.
- Where and by whom performed.
- Disposition of specimen, if taken.
- Significant observations on patient's reaction such as pain, discomfort, and apprehension.
- Patient's vital signs before and after the procedure (when these are required).

d. General Rules for Collection of Specimens—The "Nine Rights."

(1) The right specimen from

(2) The right patient, collected in

(3) The right manner, at

(4) The right time, into

(5) The right container, in

(6) The right amount, and with

(7) The right label, is taken to

(8) The right place in the laboratory, and handed to

(9) The right person.

e. General Precautions in Collecting and Handling Specimens.

(1) Wash hands before and after touching specimens and used specimen containers.

(2) When a sterile specimen is required, collect it in a sterile container with sterile technique.

(3) Collect the specimen in the container provided by the laboratory. These containers are sterile when so required and, even when not sterile, are chemically clean.

(4) In collecting infectious material (*for example,* from a patient in Isolation), observe the following precautions to make it possible for all persons who must handle the specimen to protect themselves from contamination:

- Keep the outside of the container free from any infectious material.
- Attach to the container an identifying label

with the statement "infectious material" clearly recorded.

- Place the labeled container, securely stoppered, into a clean paper or plastic bag.
- Attach the laboratory request form (SF 514-series) to the outer surface of the bag with a paper clip or staple.

f. Use of Standard Forms (Laboratory Reports). Requests for laboratory examination of specimens are initiated by the medical officer. An appropriate form of the SF 514-series (of which there are many), properly filled out and signed by the medical officer or his representative, is submitted to the laboratory in duplicate. On completion of the test requested, laboratory personnel record the result in the appropriate space on the form. The original copy, whether patient is hospitalized or is an outpatient, is returned to the office, or agency, of origin where it is filed with the patient's clinical record. The duplicate copy is retained in the laboratory office files. Sample copies of representative forms with the completed laboratory report are shown in figure 5–108. The medical specialist should become familiar with the numerous SF 514 forms, their titles and uses, by reviewing the blank forms available as basic ward or clinic equipment and discussing entries with his medical officer or nursing team leader. He may often be responsible for completing some of the information required and forwarding the proper request form to the laboratory. In general, the medical officer is responsible for providing clinical data and designation of the examination required, and clerical or nursing personnel complete the other initiating entries. The medical specialist should:

(1) Refer to the schedule published by the laboratory to show the days and hours during which requests for various tests should be submitted. Exception to the published schedule is made in an emergency. However, it is customary for the laboratory to stipulate that an emergency request be marked "Emergency" and signed by the doctor requesting the examination.

(2) If the test specimen is to be obtained by laboratory personnel at the patient's bedside, send the request to the laboratory one working day in advance of the day that the particular test is scheduled, except for emergency requests which receive immediate attention.

(3) If the patient is ambulatory and the test specimen is to be obtained in the laboratory, send the request with the patient to the laboratory during the scheduled period for the particular test.

NOTE

Be sure that the patient understands where to report, what time to report, and how to get there.

(4) Any time that the test specimen is obtained by the medical officer or ward personnel, send the request with the specimen to the laboratory. Attach an identifying label to the container showing the patient's name, register number, ward, date, and type of specimen, in addition to submitting the appropriate laboratory request slip.

(5) Safeguard the reports sent back to the ward. It is customary for the ward officer to initial the test report to indicate that he has seen it, and it is then attached to SF 514 (Clinical Record —Laboratory Report) in the patient's clinical record.

NOTE

Always verify identification when attaching reports to the record (this duty may be assigned to a ward clerk or to nursing personnel) as mistakes in filing can occur.

g. Use of Standard Forms (Radiographic Reports). Requests for radiographic examination of a patient are initiated by the medical officer. SF 519A (Clinical Record—Radiographic Reports), properly filled out and signed by the medical officer requesting the examination, is submitted to the X-ray clinic in duplicate. As a general rule, requests for examination of hospitalized patients, except emergencies, are forwarded to the X-ray clinic, and the patient is sent for examination upon call. Requests for examination of out-patients usually accompany the patient. When the report of the X-ray examination has been entered on SF 519A, the original is returned to the requesting agency where it is filed with the patient's clinical record (by attaching the form to SF 519. The duplicate copy is filed in the X-ray clinic.

h. Diagnostic and Specimen Collecting Procedures. Some selected procedures commonly performed in AMEDD treatment facilities and not included elsewhere in this manual are outlined in table 5–8. All procedures listed should be checked with local station orders. When using the table, refer also to the general instructions in *a* above.

HORN, Richard MSG/Ret
65M 36892
Mayer Army Hospital
Ft Snow, Ariz.

REGISTER OR UNIT NO. 36892 | WARD NO. 21A | ☐ BED PATIENT ☒ AMBULATORY
REQUESTED BY MAJ McCloud | DATE OF REQUEST 7 Jan 6X
DATE, TIME, AND METHOD OF COLLECTION 7 Jan 0630 Clean void

PATIENT'S LAST NAME—FIRST NAME—MIDDLE NAME

X	COLOR-APPEARANCE	X	MICROSCOPIC: REMARKS
X	REACTION		
X	SPECIFIC GRAVITY		
X	ALBUMIN		
X	SUGAR		
X	ACETONE		

514-210

DATE OF REPORT | SIGNATURE (*Specify Lab. if not part of requesting facility*)
NAME OF MEDICAL FACILITY

Standard Form 514-A—Rev. June 1959. Bureau of the Budget Circular A-32 — URINALYSIS

JONES, Isabel D/A/2LT
23F 25150
USAH
Ft Benson, Ky.

REGISTER OR UNIT NO. 25150 | WARD NO. B-2 | ☒ BED PATIENT ☐ AMBULATORY
REQUESTED BY AND DATE MAJ Lester | DATE AND TIME COLLECTED 14 Feb 6X 0745
CLINICAL DATA T-103° Poss. pneumonia

PATIENT'S LAST NAME—FIRST NAME—MIDDLE NAME

EXAMINATION REQUESTED	SPECIMEN AND SOURCE	ANTIBACTERIAL THERAPY
Culture & Sensitivity	Sputum	NONE

REPORT

514-1206

DATE OF REPORT | SIGNATURE (*Specify Lab. if not part of requesting facility*)
NAME OF MEDICAL FACILITY

Standard Form 514-K—Rev. June 1959. Bureau of the Budget Circular A-32 — GPO 1960 O-535929 — BACTERIOLOGY

STAT

COBB, James W. SGT
RA 287 601 263
34M 87607
Brooke Gen Hosp
FSH Tex

REGISTER OR UNIT NO. 87607 | WARD NO. 43H | ☐ BED PATIENT ☒ AMBULATORY
REQUESTED BY AND DATE LTC Baldwin | DATE AND TIME COLLECTED 3 Nov 6X 0800
CLINICAL DATA Poss. GI bleeding

PATIENT'S LAST NAME—FIRST NAME—MIDDLE NAME

X	W.B.C.			R.B.C.	
X	DIFFERENTIAL COUNT		X	HEMATOCRIT	
	NEUTROPHILES			HEMOGLOBIN	
	BLASTS			BLEEDING TIME	
	MYELOCYTES			COAGULATION TIME	
				BLOOD MORPHOLOGY: REMARKS	
	BASOPHILES				
	PLATELETS				
	SEDIMENTATION RATE				
	C.S.R.				

514-211

DATE OF REPORT | SIGNATURE (*Specify Lab. if not part of requesting facility*)
NAME OF MEDICAL FACILITY

Standard Form 514-B—Rev. Dec. 1964 Bureau of the Budget Circular A-32 — HEMATOLOGY

Figure 5–108. Sample completed copies of representative forms of the SF 514-series.

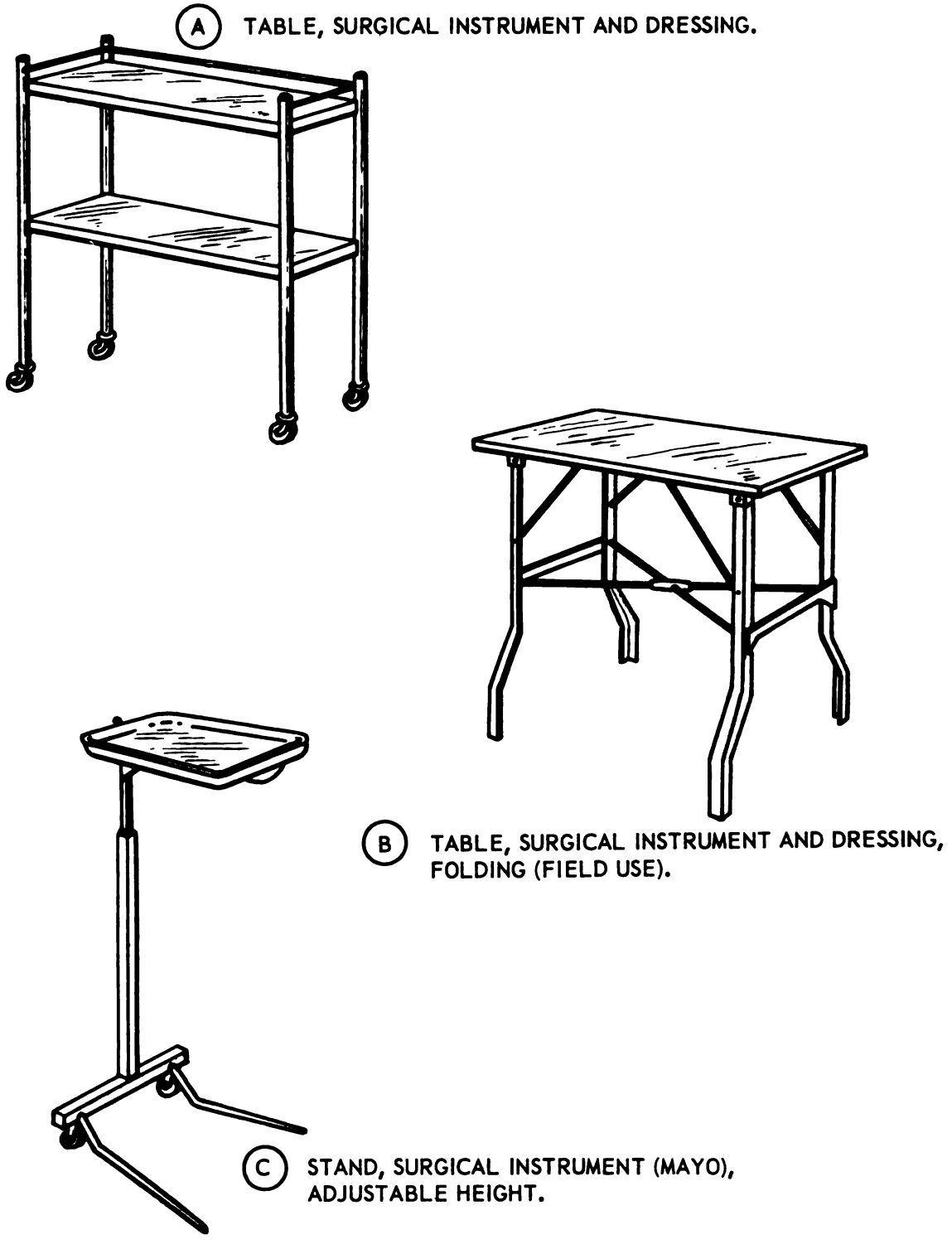

A TABLE, SURGICAL INSTRUMENT AND DRESSING.
B TABLE, SURGICAL INSTRUMENT AND DRESSING, FOLDING (FIELD USE).
C STAND, SURGICAL INSTRUMENT (MAYO), ADJUSTABLE HEIGHT.

Figure 5-109. Surgical dressing or instrument tables or stands.

NOTE

Some procedures are so complicated that tables or stands may be required to provide an adequate surface area on which to set up the sterile field. Figure 5-109 illustrates two of these tables and one stand usually referred to as the Mayo stand.

Table 5–8. Assisting With Diagnostic Tests and Collection of Specimens

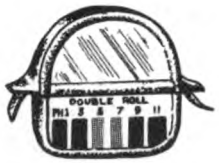
Specimen /test	Equipment	Method of collection: General Instructions	Duties of medical specialist	Remarks
A. URINE				
1. Single specimen (routine voided).	Urine specimen bottle; specimen bottle cap; urinal or bedpan p.r.n. SF 514A.	1. Have patient void directly into urine specimen bottle if possible. 2. Collect 120 ml (4 oz.) of freshly voided urine from clean urinal or bedpan p.r.n. 3. Do not collect specimen contaminated with feces. 4. If female patient, ask doctor if specimen is acceptable during menstrual period.	1. Indicate "Routine voided" on SF 514A for method of collection. 2. Instruct ambulatory patient to void directly into bottle, to cap bottle, and to leave it at designated location, in utility room or at bedside. 3. Secure request slip to bottle with rubber band. 4. Send to laboratory as soon as possible, within hours scheduled by laboratory for accepting routine specimens.	1. Send specimen to laboratory as soon as possible—urine decomposes rapidly when left at room temperature and the most valid testing is done with a fresh specimen. 2. For routine admission specimen, obtain first voided specimen the morning after admission. Random specimens (those obtained at any time) are acceptable when laboratory schedule permits.
2. Single specimen (sterile)--	Catheterization setup; sterile screw-top collection bottle; SF 514A; label.	1. Catheterize per doctor's order. 2. Collect urine directly from catheter.	1. Indicate "catheterized" in space on SF 514A for method of collection. 2. Send specimen to laboratory stat.	Sterile specimens are ordered for bacteriologic testing; therefore, aseptic technique is essential.
3. Single specimen (clean-catch).	Sterile articles: gloves, cotton balls, water, solution basin, Kelly forceps, surgical soap solution, wide-mouth bottle with screwcap. Clean articles: Commode or emesis basin, bedpan for female patient. SF 514A; label; water; and drinking glass.	1. Hydrate patient by giving 2 glasses of water about 1 hour before attempting obtain specimen. 2. Set up sterile field in screened cubicle or screened area in treatment room. 3. Male patient: Cleanse glans penis as for catheterization. Instruct patient to start forceful voiding into commode or basin. Collect midstream specimen directly into bottle, holding bottle at bottom and away from contact with penis. Collect at least 60 ml. 4. Female patient: Place patient on bedpan in dorsal recumbent position. Cleanse vulva and meatus as for catheterization. While holding labia apart with gloved hand, instruct patient to start voiding forcefully into bedpan. Collect midsteam specimen directly into bottle, holding bottle at bottom and	1. Indicate "clean-catch" in space provided on SF 514A. 2. Explain reason for method to patient—he is expected to void under unaccustomed circumstances and will be under some stress. Expect him to be embarrassed, but try to reassure him. Provide maximum privacy. 3. Send specimen to laboratory stat.	Clean-catch technique is used to obtain specimen for bacteriologic study without subjecting patient to hazards of catheterization. If physically able and capable of following instructions, the patient may obtain own clean catch specimen. Thorough and explicit instructions are necessary. The patient must be able to cooperate fully and void forcefully on demand for specimen collections.

Table 5-8. Assisting With Diagnostic Tests and Collection of Specimens—Continued

Specimen /test	Equipment	Method of collection: General Instructions	Duties of medical specialist	Remarks
		away from any contact with vulva or perineum.		
4. 24-hour specimen	Collection bottle (gallon size or other large capacity); funnel, if collection bottle has narrow neck; label or shipping tag; urinal or bedpan; SF 514A; worksheet with date and patient's name; pencil.	1. Usual diet and fluid intake is continued unless otherwise ordered. 2. At a specific time on the first day, the patient voids and this specimen is discarded. The exact time of voiding is noted and written on the worksheet (for example, 0730). 3. All other specimens are carefully collected and poured into the container during the next 24 hours. 4. Exactly 24 hours after the initial voiding (the specimen which was discarded), the final specimen is collected (*for example*, 0730 hours on the second day).	1. Indicate "24-hour collection" in space provided on SF 514A. 2. Attach label or tag to collection bottle. 3. Instruct patient that all urine must be saved. Every voiding should be accounted for on the worksheet during the specified 24 hours. An ambulatory patient must use a urinal (bedpan for female patients) and notify the specialist immediately after each voiding. 4. After final specimen is collected, send entire amount to laboratory.	1. The beginning of a 24-hour urine collection test is the exact time the patient voids and empties his bladder for the initial discard specimen. All subsequent specimens are saved. 2. Refrigerate collection bottle if a refrigerator for storage of specimens is available. 3. Follow laboratory instructions for use of preservative—any chemical used must be one that will not interfere with required testing. Indicate on label the type used (Toluene and Formalin are examples of urine preservatives).
5. Two-glass specimen (midstream collection).	2 urine specimen bottles, with caps: 2 labels: No. 1, and No. 2 with name, date, hour.	1. Patient collects first voiding in the morning in 2 parts. 2. He must start to void directly into container No. 1, and then complete the voiding in container No. 2. 3. Both containers are capped and saved for examination by doctor.	1. Instruct patient. 2. Label containers. 3. Supervise p.r.n. to insure that initial urine is collected directly into glass labeled No. 1 and that midstream (while voiding continues) and final urine voided is collected into glass No. 2.	Turbidity (cloudiness) in container No. 1 indicates anterior urethritis. Turbidity in both specimens indicates anterior and posterior urethritis.
6. Fractional specimens	4 or more labeled containers; urinal or bedpan; worksheet and pencil; 4 or more labels; SF 514A, p.r.n.	1. Collect all urine voided during a specified time interval of a 24-hour period, *for example:* 0700–1100 hours 1100–1600 hours 1600–2100 hours 2100–0700 hours 2. Pour all urine voided during specified interval into labeled container. 3. In performing a test with a fractional collection specimen, mix the amount in the container thoroughly before removing any portion of it to obtain a uniform sample.	1. Label required number of chemically clean containers with date, time interval, and patient's name. 2. Prepare SF 514A if specimens are to be sent to laboratory. 3. If specimens are to be tested on the ward, find out: (a) if fractional specimen is to be discarded after a sample is taken for testing; (b) if collected specimens are to be sent to the laboratory as a 4-part specimen; or (c) if specimens are to be combined in one bottle.	Fractional urine collection is usually ordered as part of the medical management of a patient with diabetes mellitus, to find out what time of day excretion of sugar in the urine (glycosuria) is heaviest. This type of testing aids in regulation of drug (insulin or oral agents) and diet.

7. Reagent tests.....	Reagent, in form of tablet, paper strip, or solution; instructions for use of specific reagent and color chart provided by manufacturer of specific reagent; urine specimen, freshly voided; paper and pencil; test tubes, medicine droppers p.r.n.; test tube brush, for cleaning glassware used.	1. Tablets—do not handle with fingers; transfer in cap from their container to test area. Keep container tightly closed. 2. Test strips. Do not touch end to be dipped in urine with fingers. Protect from direct light, moisture, and heat when stored. 3. Solution. Do not contaminate dropper used to measure test solution. 4. Keep glassware used in testing clean—wash, using a brush and hot soapy water, rinse thoroughly, and air dry.	1. Reagent tests are based on characteristic color changes due to chemical reactions. Several of these tests are done by nursing personnel on the ward. Instructions of the manufacturer must be followed exactly—any deviation will invalidate the test. 2. Store reagents to prevent deterioration. 3. Safeguard (but display prominently in testing area) color charts and instructions. No guesswork is permissible.	1. Request verification by competent individual of any reagent test result that seems questionable. 2. Save unused specimen sample until test results are verified. 3. If patient is taught to do test in preparation for home care, qualified nursing personnel must assist and supervise the patient. 4. Use care in handling all reagents—most are poisonous, and some are strong caustics.
a. Clinitest (sugar).....	Specimen of urine—freshly voided or uniform sample from fractional collection; test tube; medicine dropper; clinitest reagent tablet*; clinitest color chart. *Use only if it has light blue, mottled appearance. If dark blue, it has deteriorated and must be discarded.	1. Using medicine dropper, place 10 drops of water in clean, dry test tube. 2. Using medicine dropper, add 5 drops of urine and mix urine and water. 3. Drop 1 tablet into tube. Do not shake the tube while chemical reaction (bubbling and heat) is taking place. Hold tube by top edge, not at the bottom. 4. Wait 15 seconds after bubbling stops. 5. Hold tube next to color chart and compare.	1. Collect specimen as for single specimen 20 to 30 minutes before a meal, or as ordered (*for example*, a fractional specimen). 2. May do test on ward, in utility room. 3. Report results verbally and record on DD 728 (Nursing Notes) and if required, on DA 8–55 (Diabetic Record). 4. Discard test tube contents carefully in sink and rinse down drain with cold water. 5. Wash test tube, using hot soapy water and test tube brush. Rinse thoroughly with water and invert tube to air dry.	Color reactions described as— Negative percent—Blue Trace ¼ percent—Clear green Positive ½ percent (+)—Green/Yellow Positive ¾ percent (++)—Olive green Positive 1 percent (+++)—yellow Positive 2 percent (++++)—Orange/Red Over 2 percent causes rapid color changes to green, tan, orange, and finally to a dark shade of greenish brown, which should not be confused with any color on the chart. Sometimes, when the percentage amount is very large, this final change takes place before the 15-second wait is over—thus, the necessity of watching the reaction continuously.
b. Clinistix or testape (sugar).	Specimen of freshly voided urine or uniform sample from fractional collection; reagent strip; color chart.	1. Dip end of tape not touched by fingers into urine and remove immersed end. 2. Wait 1 minute, then compare darkest area to color chart.	Same as steps 1, 2, and 3 in a, above.	Color reactions described as— Negative—Yellow Positive (+)—Light green Positive (++)—Medium green Positive (+++)—Dark green Positive (++++)—Darkest green If tape color is (+++), wait one

Table 5–8. Assisting With Diagnostic Tests and Collection of Specimens—Continued

Specimen /test	Equipment	Method of collection: General Instructions	Duties of medical specialist	Remarks
				additional minute and make final color comparison.
c. Acetest (acetone).....	Specimen of freshly voided urine, or uniform sample of fractional collection; medicine dropper; filter paper or tissue; color chart; Acetest tablet.	1. Place paper on dry surface. 2. Place tablet on paper. 3. Place 2 drops of urine on the tablet. 4. Wait 30 seconds. Compare tablet color to color chart— Negative (normal reaction)—cream color Trace—lavender Moderate to strongly positive—purple.	Same as steps 1, 2, and 3 in a above.	Test for acetone is usually done when urine has tested strongly positive for sugar. Positive test for acetone (acetonuria) is also commonly present in acute gastrointestinal disorders and fever conditions when there has been vomiting, dehydration, and limited intake of carbohydrates.
d. Sulkowitch (calcium).....	Specimen of freshly voided urine; test tube; Sulkowitch reagent solution (from laboratory); indicator tape for pH (acid-alkaline) reaction.	1. Place 5 ml. of urine in test tube. Test with indicator paper. If not an acid reaction, do not proceed. If acid reaction, add 5 ml. of reagent. 2. Mix and let stand for 5 minutes. 3. Hold tube against dark background and observe for a white cloudy appearance. *Note.* A normal result is a definite cloudiness through which newspaper print may be read.	1. Collect urine as for a single random specimen (or a 24-hour collection may be ordered). Test may be done on the ward if voided urine tests acid in reaction; if urine is neutral or alkaline, laboratory technician should conduct test. 2. Follow doctor's instructions for recording reactions, using SF 514A, and place this report on his desk.	The patient should be on a low calcium diet (*for example*, a milk-free diet) for 72 hours before collection of the specimen to prevent undue dietary influence on the examination. Strongly positive (white, chalky precipitate) reaction indicates high calcium excretion associated with hyperparathyroidism. Absence of cloudiness (negative) indicates abnormally low excretion, associated with hyperparathyroidism and possibly tetany.
e. pH Reaction..... 	Freshly voided specimen; indicator paper strip and dispenser; color chart.	1. Dip tip of strip* untouched by fingertips into specimen. 2. Compare resulting color with standard chart provided with item used. *If litmus paper strip is used, the color reaction is red if urine is acid and blue if urine is alkaline.	1. Collect specimen as for single random specimen. 2. Follow instructions for testing on ward. 3. Follow instructions for discarding test specimen or sending it to laboratory with SF 514A.	The usual reaction in freshly voided urine is acid (about pH 6). As urine stands at room temperature, it becomes increasingly alkaline (pH above 7). Diet, drugs, pathologic conditions, and fluid intake influence the reaction. In treating bacterial infections of the kidneys and bladder, the doctor may prescribe diet and drugs that will keep the urine either acid or alkaline, and frequent testing of the urine may be required.

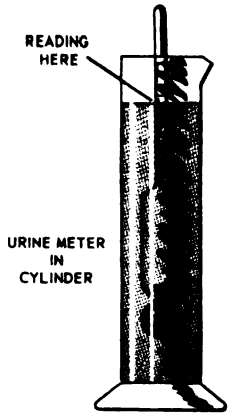
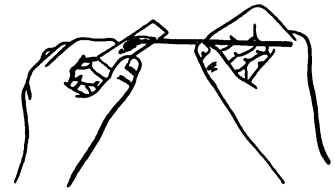
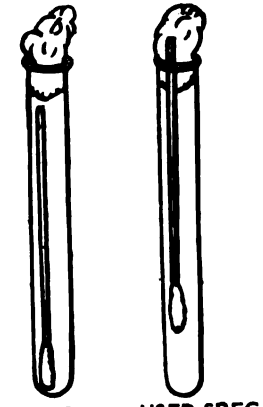
8. Specific gravity..... 	Urinometer and urine cylinder (a 2-part set); freshly voided specimen. *Note.* 2 standard items are available, one a "microset" requiring only about 16 ml. of urine, another, a larger type (as illustrated), requiring at least 50 ml. of urine. A nonstandard research item may be used in special treatment units, and this requires only a drop or 2 of urine.	1. Allow freshly voided specimen to cool to room temperature. 2. Place cylinder of urinometer set on a level surface. Fill cylinder ¾ full with urine. 3. Hold urinometer at the top of the stem and place it in the specimen in the cylinder, giving the urinometer a spin so that it rotates free of the sides. *Note.* There must be sufficient urine to float the urinometer; its bottom must not touch the bottom of the cylinder. 4. When urinometer stops spinning, read value from the bottom of the meniscus (fig. 4–2).	1. When test is done on the ward, check the urinometer set periodically, using distilled water. The reading should be 1.000 at the temperature specified on the instrument. If these conditions cannot be met, do not attempt to do the test and send the specimen to the laboratory. 2. Always squat down and read specific gravity valve at eye level—line of sight is where the meniscus crosses the scale on the urinometer.	1. The specific gravity depends upon the amount of solid material in solution and the volume of the specimen. Generally speaking, the more concentrated (low volume), the higher the specific gravity; the more dilute (high volume), the lower the specific gravity. Normal random specimens have a range of 1.003 to 1.030. 2. The scale on the urinometer is in relation to the specific gravity of distilled water—(1.000). Calibration is in units of 0.001, from 1.000 at the top of the scale to 1.060 at the bottom.
B. FECES (STOOL SPECIMENS): 1. Single Specimen (routine, for occult blood, etc).	Wide-mouth container with tight-fitting cover; clean bedpan p.r.n., tongue blade; SF 514G.	1. If possible, have patient pass stool directly into specimen box. 2. If bedpan is used, instruct patient not to void into pan from which stool is to be collected. 3. Collect stool from pan by picking up a portion at least 1 inch in size with tongue blade and place stool in clean dry container. 4. Send specimen and SF 514G to laboratory stat.	1. Instruct ambulatory patient and provide him with specimen container. Also show patient how to place bedpan on toilet commode if pan must be used. 2. Keep outside of container clean.	Feces specimens should not be contaminated with water or urine. The container is not sterile but should be clean. Feces specimen examination is an important public health (preventive medicine) measure in physical examination of food handlers to detect carriers of typhoid bacilli and intestinal parasites. Diagnostic tests include observation for pus, blood and bacteria, as well as chemical reagent tests for foods, such as fats and starches in metabolic diseases. In submitting specimens to the laboratory a notation should be made on the Request Form, SF 514G, if the patient has received antibiotic or chemotherapy within 2 weeks before the examination. *Note.* Do not collect for parasite studies for 7 to 10 days following radiology barium studies.
2. Ova and parasites.....	3 wide-mouth containers with tight-fitting covers; 3 undated requests; 3 labels; SF 514G.	1. Label 3 containers, No. 1, No. 2, and No. 3. 2. Collect 1 specimen on 3 successive days. 3. Write in date of collection on SF 514G when specimen collected, and number accordingly.	1. Follow steps 1 and 2 above. 2. Remind patient daily of specimen requirement. 3. Record each collection by number on DD 728 (Nursing Notes).	

Table 5–8. Assisting With Diagnostic Tests and Collection of Specimens—Continued

Specimen/test	Equipment	Method of collection: General Instructions	Duties of medical specialist	Remarks
3. Amoeba	Glass or plastic, wide-mouth container, basin of warm water.	1. Collect entire specimen. 2. Keep warm by placing covered container in basin of warm water.	1. Check laboratory schedule before obtaining specimen. 2. Take to laboratory stat, since examination is for detection of live organisms.	
4. Pinworm (Enterobiasis specimen).	Transparent plastic tape; glass slide; SF 514G.	1. Press sticky side of transparent tape over anus and perineal folds. 2. Remove tape and press sticky side down on surface of clean, dry, glass slide. 3. Send slide and request slip to laboratory.	1. Female personnel obtain specimens from female patient. If patient is ambulatory, must have female chaperone when sent to laboratory for specimen collection. 2. Check local directive—may require early morning collection before any bath or toilet hygiene and before defecation.	Unlike other parasite specimen collection procedure, stool specimen not required. (Female worm migrates outside anus to deposit eggs.) *Note.* When enterobiasis disease (pinworm disease) is present: insist on rigid toilet hygiene: hand washing, scrub toilet seat daily, change underclothing and bed linen daily, remind patient not to scratch itching anal area.
C. SPUTUM:				
1. Single specimen	Plastic or glass, screw-topped container; SF Form 514E; label; clean paper bag. *Note.* Do not use cardboard folded sputum cup for specimen collection.	1. Collect, if possible, first a.m. coughed-up specimen. 2. Have patient first rinse mouth with water and spit out all fluid and saliva. 3. Then assist patient to give a "deep down" cough to raise sputum from bronchi. 4. Instruct patient to expectorate coughed-up sputum directly into collection jar, without touching lips to jar. Try to obtain at least 5 ml. of sputum (about 1 teaspoonful). 5. Cap jar securely and remove it from bedside stat.	1. Write on SF 514E the type of examination required; for example, specify "Pneumonia" or "For Tbc" (Tuberculosis). Laboratory examination methods differ, depending on type of organism to be identified. 2. Give mouth care after obtaining specimen. 3. Handle as for infectious material. Inclose in paper bag. 4. Send to laboratory stat.	Handle all sputum specimens as infectious material. Single specimen collection is usually ordered for identification of organisms in pneumonia, before start of antibiotic or chemotherapy. "Series specimen" usually 3 successive specimens obtained on 3 successive days.
2. 24-hour series (3-day specimen).	3 plastic or glass, screw-topped jars; 3 identification labels; 3 SF 514E.	1. Check local order as to whether single morning specimen for 3 successive days is to be collected, or if all sputum in one 24-hour period is to be collected, on 3 successive days. 2. Collect only sputum coughed up from bronchi, not saliva or other mouth and throat fluids. 3. If single specimen, cap jar and remove from bedside stat.	1. Follow local order for specimen instructions—3-day specimen collection is often for Tbc, requiring special handling. 2. Number each specimen container, No. 1, No. 2, No. 3. Each numbered container is sent to the laboratory with its accompanying Request Slip, SF 514E, dated at time specimen was obtained. 3. Handle as for infectious material.	If one or two specimens are obtained, but it is impossible to obtain third, notify medical officer and notify microbiology section of laboratory. Medical officer may order gastric washing, and laboratory technician may proceed with testing of specimens obtained.

		4. If 24-hour specimen, cover unsightly jar with tissue held in place by elastic band. Remind patient not to touch top of jar with lips or fingers. Show how to remove and replace cover without contamination.		
3. Gastric washing (aspiration for tubercle bacilli).	Container from microbiology section of laboratory; Levin tube (gastric intubation) tray; Luer syringe, 30 ml, with metal adapter tip; "NPO" bed sign; sterile saline p.r.n.	1. Disposable plastic Levin tube preferably used as precautionary measure in suspected tuberculosis. 2. Lubricate tube with water only. 3. Intubate as for gastric intubation. 4. Aspirate entire stomach contents and place in specimen container. *NOTE:* Check local laboratory policy concerning use of sterile saline solution for "washing" stomach to obtain contents.	1. Instruct patient on preceding evening—nothing by mouth after 2200 hours. 2. Early morning (on awakening) aspiration of stomach contents may be ordered, with nurse or qualified medical specialist performing intubation and obtaining specimen. 3. Handle specimen as "infectious material." 4. Remove and discard plastic Levin tube. 5. Soak all reusable equipment in Wescodyne solution, 150 ppm., before handling for return to CMS.	Gastric washing procedure used to obtain specimen for tubercle bacilli studies when little or no sputum can be obtained. (Fasting stomach in early morning contains sputum swallowed in small amounts overnight.) Check ward policy procedure for gown and mask use in obtaining gastric wash specimen.
D. VOMITUS:	Clean wide-mouth container with lid; label; SF 514M (Miscellaneous).	1. Transfer vomitus from basin or other container into which patient has vomited to clean specimen container. Avoid contamination. 2. Collect all vomitus available. 3. Cover container and affix label. Be sure time of vomiting is noted. 4. Send to laboratory with request form.	1. If authorized to fill in data on request form, state what examination is requested; *for example* "occult blood." If poisoning is suspected, data should be entered by medical officer. 2. Take or send specimen immediately to the laboratory, calling its delivery to the attention of the laboratory technician. 3. Record on DD Form 640, (Nursing Notes).	Vomitus specimens usually sent to chemistry section of laboratory. *Note.* It is usually advisable to save all vomitus for inspection by medical officer, who will then order required examination. Pending orders of medical officer, remove utensil from patient's bedside, cover it with a clean paper towel, and label "Do Not Discard."
E. SMEARS AND CULTURES: 1. Smear	Cotton-tipped applicator, sterile; glass slides, sterile; SF 514K (Bacteriology); rubber bands—2; label.	1. Wrap one rubber band around one end of slide, holding slide by side margins to avoid fingerprints and contamination of flat surface. 2. With sterile applicator, pick	1. When directed by the medical officer to obtain a specimen for bacteriological studies, use aseptic technique to avoid contamination of specimen, self, and surroundings.	Identification of pathogenic organisms is the primary concern when smear and culture specimens are ordered. The prepared smear is stained in the laboratory and then

Table 5-8. Assisting With Diagnostic Tests and Collection of Specimens—Continued

Specimen /test	Equipment	Method of collection: General Instructions	Duties of medical specialist	Remarks
		up small sample of moist discharge. 3. Spread discharge lightly on center of slide by rolling applicator tip across center (as illustrated) 4. Set slide down, smear side up, to air dry. 5. Repeat smear preparation on second slide (steps 3 and 4). 6. Place both slides together, smear sides inside. *Note.* The 2 prepared slides are separated by the previously prepared band wrapping, which helps to protect smear surfaces. A paper clip or a portion of the application stick may be substituted for the rubber band. 7. Fasten slides together with second rubber band. 8. Stick label on end away from smear area.	2. Enter complete data on SF 514K indicating site from which specimen is obtained; e.g., "Pus, wound, left knee." 3. If patient is on antibiotic therapy, include this information on SF 514K. 4. Send specimen with least possible delay to laboratory.	examined microscopically for bacteria. A thin, even distribution of material on the slides is required. 
2. Culture	Cotton-tipped applicator, sterile; sterile culture tube, cotton stoppered; SF 514K (Bacteriology); label. *Note.* For special cultures, obtain culture tube with culture media (broth) from laboratory.	1. Remove cotton stopper from culture tube, holding stopper between 2d and 3d fingers. Do not allow insertion end to touch anything. 2. Remove applicator by tipping tube, grasping wood end, and not allowing swab end to touch rim of tube. 3. Wipe swab end over surface to be cultured. 4. Reinsert applicator in tube up to where stick is held in fingers. 5. Replace cotton stopper in tube to plug opening and hold end of stick above rim of tube (as illustrated). 6. Stick label on rim end of tube.	Same as step 1 through 4 above. *Note.* When culture media tube is used, the swab should be moistened with a minimal amount of media fluid after the specimen is obtained.	The culture media prevents drying of the swab specimen. 

3. Throat culture	1. Collection tube with swab, sterile; tongue blade, clean; SF 514K; label. 2. Obtain tube containing culture media p.r.n. from bacteriology section of laboratory.	1. Face patient toward light and tell him to open mouth wide. 2. Hold tongue blade in left hand. Depress tongue, scooping it forward with blade to expose back surface of throat. 3. Holding swab in right hand, pass swab gently over throat surface. Do not touch swab to tongue, cheek, teeth, or lips. 4. Replace swab in tube without touching it to rim of tube. Area of swab stick touched by fingers extends above tube rim. 5. Replace cotton plug.	1. Prepare identification label and SF 514K (Bacteriology) as directed. 2. Use aseptic technique in handling culture tube* and swab. 3. Break tongue blade and discard immediately after use. 4. Send labeled specimen to laboratory without delay. *Since both hands are in use to obtain throat specimen, an assistant may be required to hold stopper and tube to prevent their contamination. Instruct assistant before he handles equipment.	Swab specimen should be moist when received in laboratory. Follow local directive for using culture tube containing media, which may be a fluid or a semisolid substance.

F. COLLECTION OF BLOOD SPECIMENS:				
1. General instructions	Laboratory equipment brought to ward by laboratory technician; ward blood or collection tray (or mobile cart), to include— *Sterile syringes: 30 10, 2 ml; *sterile needles; 2-inch; 20, 18 gage; sterile gauze sponges, dry; sterile gauze sponges, in skin germicide; transfer forceps (Hemostat) in jar, forceps (5 inch) containing germicide; emesis basin; hand towel with rubber or plastic protector; tourniquet; skin marking pencil; gummed labels; blood collecting tubes assorted, from laboratory. *Sterile disposable needles and syringes, when available. Otherwise, sterile equipment from CMS.	Use venipuncture technique unless otherwise instructed. Follow laboratory instructions for required amount and initial handling of blood specimen. Always use designated container for particular test desired. Transfer blood from syringe as follows: 1. Remove needle from syringe. 2. Flow blood gently down inside of blood collection tube without causing any foam. DO NOT SQUIRT BLOOD INTO TUBE. 3. Stopper tube securely. 4. If anticoagulant is used, rotate tube gently, but do not shake. 5. If clotted specimen is required (as for serology), do not rotate or agitate tube. Keep tube upright.	1. Study local directives to become familiar with different commonly performed tests which require collection of blood specimens. 2. Assist laboratory technician or medical officer as required. 3. Follow local SOP for daily checking, cleaning, and stocking of equipment maintained by ward (or clinic) for blood collection. Safeguard equipment to maintain required asepsis and economy in use of supplies. 4. Use aseptic technique when assisting with collection of blood specimens. 5. Follow all safety precautions when handling and disposing of needles, syringes, collecting tubes, etc., to prevent accidental puncture wounds or lacerations. 6. Prepare and instruct patient in accordance with local directives. 7. Send or take specimens to laboratory promptly. 8. If specimens must be held on the ward temporarily, check	1. Blood specimens for laboratory examination are usually collected by laboratory personnel. However, under conditions specified by local directive, blood specimen collection duties may be delegated to a clinical or medical specialist, at the direction and under the supervision of the ward, clinic, or dispensary medical officer. 2. In general, the clinical or medical specialist, when so assigned, will collect blood by venipuncture technique, since training in this technique is a requirement (AR 611–201) in preparation for duties performed under emergency and combat medical treatment conditions. 3. Should the duty assignment require collection of blood specimen by capillary puncture technique, refer to TM 8–227–4.

Table 5-8. Assisting With Diagnostic Tests and Collection of Specimens—Continued

Specimen /test	Equipment	Method of collection: General Instructions	Duties of medical specialist	Remarks
			with medical officer as to which specimens must not be refrigerated pending delivery to laboratory.	
2. Hematology specimens...	SF 514-B; Laboratory equipment brought by laboratory technician or ward equipment, if collection is made by medical officer or designated assistant (see 1 above).	1. Venous or capillary puncture, or both—depending upon test required, age and condition of the patient. If venipuncture, use anticoagulant collecting tube, as specified. 2. Non-fasting specimen, unless otherwise ordered.	1. Prepare request form as directed. *Note.* Usually, no special preparation of the patient is needed. 2. Assist with collection as directed. 3. Handle specimens with extreme care to avoid damage to blood. 4. Send or take to laboratory as soon as possible after collection.	1. Hematology tests are ordered to examine blood, its cellular components, and its morphology (form and structure). 2. SF 514-B lists examinations that may be requested. 3. Review information on transfer of blood from a collecting syringe to the specified collecting tube.
3. Chemistry specimens.....	SF 514-D or SF 514-P (Special Chemistry), or both; laboratory equipment brought by laboratory technician or ward equipment, if collection by medical officer or designated assistant (see 1 above). Sign for patient's bed "Hold Breakfast."	1. Venipuncture, unless otherwise specified. 2. Anticoagulant collecting tube as specified. 3. Fasting specimen, unless otherwise ordered.	Prepare request form as directed For fastening specimen: (1) Instruct patient that no food is to be taken after evening meal on day prior to test. (Water only may be permitted up to midnight.) (2) Order delayed breakfast. (3) Place "Hold Breakfast" sign on patient's bed. (4) Obtain and serve meal promptly after specimen collection or test completed. (5) Do not permit patient to smoke. (6) Follow steps 3 and 4 in 2 above.	1. Chemistry tests are ordered to determine the concentration of specified chemical substances in the blood. 2. SF 514D lists examinations that may be requested. 3. Review information on transfer of blood from collecting syringe to the specified collecting tube.
4. Serology specimens.....	1. SF 514C, S.T.S. (Serological Tests for Syphilis) or SF 514-Q (Immunology) or both. 2. Same as 2, above.	1. Venipuncture, unless otherwise specified. 2. Clotted blood specimen. 3. Nonfasting specimen, unless otherwise ordered.	Same as 2 above.	Serology tests are ordered to determine and identify the presence of antibodies. The several different tests are based on the fact that patients infected by disease-producing agents will develop antibodies specific for these agents.
5. Blood culture.....	According to local directive:	1. Venipuncture by medical	1. Review local directive for	Blood culture is ordered for

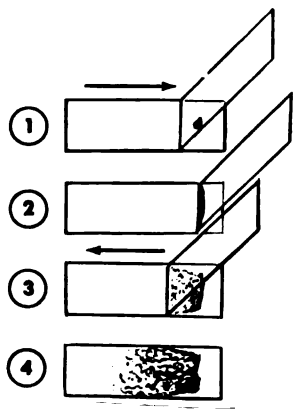
	*Laboratory equipment or ward equipment, to include special skin germicide; SF 514K, 2; labels, 2. *Equipment includes sterile flasks containing specified anticoagulant.	officer or laboratory technician using strict aseptic technique. 2. Blood inoculated immediately into each of 2 sterile flasks at bedside, or blood transferred from syringe to each of 2 sterile capped tubes containing anticoagulant for immediate transportation to laboratory.	blood culture procedure. 2. Assist medical officer or laboratory technician as required in obtaining venipuncture specimen and labeling containers. 3. Transport specimens according to explicit instructions to bacteriology section of laboratory. Call their delivery to the attention of the laboratory technician.	bacteriological studies. Blood culture specimens are usually ordered in conditions of fever of unknown origin (FUO), bacteremia, or septicemia and are obtained when the acutely ill patient is having a chill or at the height of fever. Therefore, the order by the medical officer for blood culture will usually indicate the exact conditions when the physician or laboratory technician must be notified immediately so that the blood specimen may be collected during the proper stage of the disease concerned.
6. Blood Smear (venipuncture technique).  	Glass slides venous blood (from syringe used to obtain blood culture specimen) Labels, 2.	"Spreader slide" technique: (as illustrated): 1. Place specimen slide on flat surface. 2. Transfer 1 drop of blood from needle tip to one extremity of specimen slide. 3. Place spreader slide on specimen slide at an angle of about 30 degrees from horizontal. 4. Move spreader slide toward drop of blood until contact is made with blood. (The blood will spread toward the sides of both slides.) 5. Push the spreader slide smoothly and lightly toward the opposite end of the specimen slide, drawing the blood into a film on the specimen slide. 6. To make a thin film, push the spreader slide quickly. To make a thick film, push the spreader slide slowly. 7. Allow prepared slide to air dry. Never blow on it to speed up drying. 8. Repeat steps 1 through 7, above, if a second slide is required.	1. Prepare smear by direction of medical officer. 2. Keep slides free of fingerprints before and after obtaining specimen. 3. Identify slides by affixing gummed label to extremity clear of specimen smear. Do not use skin-marking pencil unless directed to do so (a marking pencil may interfere with staining or fixative process).	Blood smears are usually made in conjunction with blood culture to detect presence of parasites, particularly malarial parasites. *Note.* The "spreader slide" technique illustrated is also used in preparing a blood smear by capillary puncture ("finger stick").

Table 5-8. Assisting With Diagnostic Tests and Collection of Specimens—Continued

Specimen /test	Equipment	Method of collection: General Instructions	Duties of medical specialist	Remarks
G. CLEARANCE TESTS:				
1. General	Dye substance for IV injection, from pharmacy. Equipment for administration of dye from ward IV tray. Equipment for collection of specimen from laboratory.	1. Dye substance administered IV by medical officer. 2. At exact time interval after administration of dye, assist with collection of specimen.	1. Prepare request form as directed. 2. Prepare patient as directed. 3. Assist medical officer as directed with preparation of dye substance and collection of specimens. 4. Record, report, and observe accurate timing of periods for collection of specimens—this is of critical importance. 5. Forward accurately labeled and identified specimens promptly to the laboratory.	1. Clearance tests measure the efficiency with which a body organ removes certain substances from the blood. Examples of tests commonly used are the BSP test, to evaluate liver function; and the PSP test, to evaluate kidney function. Both tests are based on the excretion of a dye, as measured by a colorimetry procedure conducted in the laboratory. 2. Failure to record exact time the test substance was administered and failure to record the exact time a test substance such as blood or urine is required from the patient invalidates both of these tests.
2. BSP Test	1. Ampules of BSP—qs for administration; dye substance for IV injection, from pharmacy; equipment for administration of dye from ward tray; 2 syringes, 10 ml; 2 needles, 2", 20G; 1 collecting tube; 1 label; SF 514D; watch, pencil, and paper.	*Note:* IV administration of calculated amount of dye by medical officer. 1. Record time of administration as directed by medical officer. 2. Assist with collection of 10 ml. blood specimen, by venipuncture from arm opposite that used for dye administration, exactly 45 minutes after dye has been administered.	1. Prepare request form, SF 514D (Blood Chemistry) as directed. 2. Weigh patient. Record weight in pounds. (Doctor will calculate conversion of weight in pounds to kilograms, and prepare dose of 5 mg. of BSP dye per kg. of body weight for IV injection). 3. Prepare and instruct patient for fasting specimen test (F 3, above.) 4. Assist medical officer as required. 5. Forward specimen of blood promptly to the laboratory.	1. BSP (Bromsulphalein, or synonymous preparation) is a dye which when administered intravenously is normally removed from the blood by the liver and excreted in the feces. The BSP test measures the concentration of dye in the blood. Results of the test are expressed in terms of percent retention. 2. Normal results: Less than 5-percent retention in 45 minutes after administration. 3. Observe patient for possible allergic reaction to dye; e.g., itchy feeling; hot, flushed skin. Report and record time and symptoms stat.
3. PSP Test	Ampule of PSP from pharmacy. Dye substance for IV injection from pharmacy; equipment for administration of dye from ward IV tray; 4 urine specimen bottles; 1	1. IV administration of exactly 1 ml of dye by medical officer to a previously hydrated patient. 2. Collection of urine specimens at exact time intervals after	1. Prepare request form, SF 514L, as directed, and 4 specimen bottle labels. 2. Do not apply restriction as for fasting specimen. 3. *Give as directed, 3 to 4	1. PSP (Phenolsulfonphthalein) is a red dye which is readily removed from the blood by the normal kidney and excreted in the urine. The PSP test measures the concentration of dye

	syringe (2 ml); 1 needle 2", 20G; 4 labels; SF 514-L (Renal Function); drinking water.	injection of dye: No. 1–15 minutes No 2–30 minutes No 3–60 minutes No 4–120 minutes	glasses of water to drink within 1 hour prior to the test. 4. Assist, as required, with administration of dye IV. 5. Record exact time of dye administration on SF 514L. 6. Record exact time specimens of urine are to be collected, with patient emptying bladder completely for each specimen: Specimen No. 1–15 minutes Specimen No. 2—30 minutes Specimen No. 3—60 minutes Specimen No. 4—120 minutes 7. Collect specimens on schedule. 8. Label each specimen correctly. 9. Forward all specimens together to laboratory as soon as last specimen (No. 4) is collected. (Keep all specimens together at patient's bedside pending completion of test.) *Unless otherwise ordered, the bladder is not emptied at the outset of the test since this might impair the patient's ability to void at the 55- and 30-minute intervals.	present in the urine at exactly 15-, 30- 60-, and 120-minute intervals following administration of the dye. 2. Normal results: 25% excretion in 15 minutes, and a total of at least 65% excretion of the dye in 2 hours. 3. The test requires the patient to empty his bladder completely at each collection period. If the patient has a known or suspected urine residual, a retention catheter may be ordered, to be clamped and released as required in order to collect the specimens at the exact time interval.
H. GLUCOSE TOLERANCE TEST (ORAL METHOD).	From laboratory: 5 blood collecting tubes; 5 urine specimen bottles; weighed amount of glucose. From ward: 5 sterile syringes, 10 ml; 5 sterile needles, 20 G, 2"; 10 labels; SF 514M (Miscellaneous) ward IV tray or table.	1. Patient voids fasting specimen—all urine is saved in urine specimen bottle. 2. Immediately after the patient voids, a fasting blood specimen is obtained by venipuncture. 3. Immediately after fasting specimens are obtained, the patient drinks 400 ml. of prepared glucose. Time is recorded when glucose is ingested. 4. Blood and urine samples are collected, and time of collection is recorded at following intervals: ½ hour after glucose ingestion 1 hour after glucose ingestion 2 hours after glucose ingestion 3 hours after glucose ingestion	1. Prepare request form (usually SF 514-M (Miscellaneous)) as directed. Make appointment as per laboratory schedule. 2. Prepare and instruct patient for fasting specimen test (F 3, above) with this exception: there may be, by specific order, a controlled administration of water to hydrate patient for obtaining urine specimens. Check local directives. 3. Instruct and assist patient to avoid exercise and anxiety. He should be as relaxed as possible during the test. 4. Obtain 5 blood collection tubes, 5 urine specimen bottles, and weighed amount of glucose from laboratory 1 day prior to test.	Tolerance tests determine the rate of utilization of a particular substance by the body. As in clearance tests, failure to record exact time the test substance was administered and failure to record the exact time a test substance such as blood or urine is required from the patient invalidates the tests. In the glucose tolerance test a determination is made of the body's ability to handle a sudden load of glucose, a pure carbohydrate. A given amount of glucose is administered (PO or IV) and at periodic intervals, blood and urine samples are obtained and analyzed in the chemistry section of the laboratory for glucose content. The

Table 5-8. Assisting With Diagnostic Tests and Collection of Specimens—Continued

Specimen /test	Equipment	Method of collection: General Instructions	Duties of medical specialist	Remarks
		5. The 5 blood specimens and 5 urine specimens are sent to the laboratory. *Note.* The patient is usually instructed to drink the 400 ml. of prepared glucose solution within 10 minutes. The time recorded is when all of the solution has been ingested.	5. Prepare written schedule to use as a worksheet in assisting with test—to include— Specimen No. 1: Time fasting urine Time fasting blood Time glucose administration Specimen No. 2: Time, Blood, Urine } ½ hour after glucose ingestion Specimen No. 3: Time, Blood, Urine } 1 hour after glucose ingestion Specimen No. 4: Time, Blood, Urine } 2 hours after glucose ingestion Specimen No. 5: Time, Blood, Urine } 3 hours after ingestion 6. Prepare, p.r.n., at 0700 hours on morning of test, the glucose solution, as ordered. Chill solution after glucose is completely dissolved to make it more palatable. 7. At time of start of test, assist medical officer as directed, observing and recording exact time intervals until entire collection of specimens is completed. 8. Send 5 blood specimens and 5 urine specimens to laboratory, with each specimen labeled with the exact time of collection.	test is commonly ordered in the diagnosis of diabetes mellitus, in which there will be a decreased tolerance with a marked and prolonged blood glucose level (hyperglycemia). (Normally, the fasting level blood glucose is 80–120 mg. per 100 ml. of blood; there is a sharp increase for up to 2 hours, and then a fall to the original fasting level.) The measured amount of glucose is dissolved in a measured amount of water, flavored with lemon juice. Usually, 400 ml. of a 12.5 percent solution is prepared. (Preparation may be on the ward, or the solution may be obtained from the laboratory.)
I. GASTRIC-INTESTINAL ANALYSES: 1. Gastric analysis—single specimen.	Gastric intubation tray—Levin tube setup. Syringe, 30 ml Luer specimen container, SF 514F, label.	1. Following intubation by medical officer, tube is taped to face, and fasting specimen is withdrawn by Luer syringe. *Note.* Patient is instructed not to swallow any saliva or sputum for duration of test.	1. Prepare request form as directed. 2. Assemble and prepare equipment. 3. Instruct patient as for fasting specimen (F 3, above).	1. In a single specimen gastric analysis, the contents of the stomach in the fasting state are exhausted. In a fractional specimen gastric analysis, the fasting specimen is obtained and

		An emesis basin and tissues must be provided for expectoration, which may be copious. 2. Specimen (average 30–50 ml. in volume) is placed in specimen container.	Help patient to relax and be free of anxiety. 4. Do not permit smoking until test is completed. 5. Do not permit brushing of teeth on morning of test. 6. Label and forward specimen with request form to Chemistry Section of laboratory.	then a suitable stomach stimulant, called a test meal, is administered by tube or parentally and samples of stomach content are withdrawn at periodic intervals. 2. Chemical tests are done to determine the acid content of all the gastric specimens. Hyperacidity is characteristic of duodenal ulcer, gastric ulcer, and chronic gastritis; hypoacidity is characteristic of gastric carcinoma; anacidity (absence of any acid) is often encountered in pernicious anemia. 3. Chemical tests with a reagent indicator to determine the presence of occult blood may also be ordered. It is important to avoid any injury from intubation; even traces of blood from gum trauma may interfere with a valid test for occult bleeding; therefore, patient should not brush teeth before obtaining gastric specimens. Give mouth care after tube is withdrawn.
2. Gastric analysis—fractional (test meal) analysis.	Same as 1 above, plus: 5 (or more) specimen bottles; 5 (or more) labels. Test meal as ordered.	1. Same as the steps in 1, above. 2. Medical officer administers test meal substance. It may be 50 ml. of 7% ethyl alcohol administered by tube, or histamine subcutaneously. 3. At specified intervals, specimens are withdrawn by Luer syringe, placing each sample in separate labeled container.	1. Same as 1, Steps 1 thru 5, above. 2. Follow local directive and medical officer's instructions for obtaining fractional specimens at specified intervals. All available contents are withdrawn for each sample. 3. If histamine is ordered, take and record pulse and BP 10 minutes before and 10 minutes after dose. Histamine is a powerful drug and untoward reactions may occur. Have epinephrine 1–1000, 0.5 ml. in syringe, or a prescribed antihistamine immediately available.	
3. Gastric analysis—tubeless.	Dye preparation (such as Diagnex Blue); gastric secretion-stimulating drug; drinking water; urine specimen bottle; SF 514-F; label.	1. Fasting patient receives gastric secretion-stimulating drug (such as caffeine sodium benzoate, p.o.). 2. Patient voids 1 hour after receiving above drug. Urine is discarded. 3. Patient takes, by mouth, dye preparation granules with water, as ordered. 4. Patient voids 2 hours after dye ingestion. This specimen is saved and sent to laboratory.	1. Instruct patient on "NPO" order the evening before the test. 2. Follow doctor's written order for administration of drug and dye the morning of the test. 3. Save all urine voided in 2-hour interim between administration of dye and termination of the test. 4. Send specimen to laboratory at once.	This "tubeless" technique is used as a screening test—the result may determine whether or not the patient will be scheduled for a conventional gastric analysis requiring gastric intubation. The dye preparation taken by mouth is released in the stomach only if acid is present in stomach secretions; if released, it is absorbed and excreted in the urine. The urine will have a blue color.
4. Duodenal (biliary) drainage specimens.	Intubation tray—as for gastric analysis, with Rehfuss tubes in basin of ice; Luer syringe, 30 ml.	The sequence of specimen collecting procedure is usually as follows: 1. Oral intubation of metal-	1. Obtain equipment and prepare for intubation procedure at bedside. 2. Prepare patient for collection	Duodenal drainage and fractional bile specimens are obtained by special duodenal intubation and drainage tech-

Table 5-8. Assisting With Diagnostic Tests and Collection of Specimens—Continued

Specimen /test	Equipment	Method of collection: General Instructions	Duties of medical specialist	Remarks
	*Specimen bottles-5; Magnesium Sulphate, USP for injection, ampule; icebucket, with ice; SF 514—as directed; labels, 5. *Specimen bottles—usually acid-cleaned urine specimen bottles obtained from laboratory.	tipped Rehfuss tube by the medical officer. 2. Fasting stomach contents aspirated. If saved, this is placed in bottle No. 1. 3. Patient is placed in right, lateral recumbent position with hips elevated 6 to 8 inches. 4. Tube advanced about 2 inches every 5 minutes until circular marking No. 2 on tube is at lip margins. (At this point, tube should have reached duodenum-about 20 minutes after gastric aspiration.) 5. The free end of tube is placed into bottle No. 2 for collection by drip drainage of about 10 cc. of duodenal drainage. *Note.* As specimens are collected, place specimen containers 2, 3, 4, and 5 in ice bucket containing ice. 6. Magnesium sulphate solution is instilled by gravity through syringe barrel to stimulate bile flow into duodenum. 7. Tube is clamped for 5 minutes. 8. Fractional bile specimens are collected into labeled bottles as follows: No. 3—Bile A (light yellow—from common bile duct). No. 4—Bile B (dark, golden—from gallbladder) No. 5—Bile C (light, thin, yellow—from liver). 9. Rehfuss tube is removed, following collection of specimen No. 5. (Tube removal must be a gradual process, to overcome the tugging sensation due to the tip's location in the intestine.) 10. All specimens sent to laboratory as soon as possible and transported in iced container.	of fasting specimens as in F 3, above. 3. Prepare 5 specimen labels: No. 1—gastric contents, fasting No. 2—Duodenal drainage, fasting No. 3—Bile A No. 4—Bile B No. 5—Bile C 4. Assist medical officer, as he directs, with intubation procedure. 5. Position patient flat in bed, lying on right side. Then elevate knee gatch to raise hips 6 to 8 inches. 6. Assist with collection of specimens as directed by medical officer. (Placing collection bottle in use on chair seat at bedside facilitates gravity drainage.) Make sure end of tube is placed securely in bottle to avoid loss of specimen. 7. Assist with removal of Rehfuss tube, as directed by medical officer. 8. Assist patient with mouth care immediately after removal of tube. 9. Remove and care for equipment for return to CMS.	niques. The metal tip on the Rehfuss tube facilitates passage of the tube through the stomach and the special positioning of the patient facilitates collection of the required specimens. Collection technique is always as directed by the medical officer, with intestinal specimens obtained by gravity drainage and not by syringe aspiration. Close attention during this time-consuming procedure is essential. It is usually not too uncomfortable for the patient, although he must remain in the prescribed position for the duration of the procedure.
J. BODY FLUID ASPIRATION (EXTRA-				

VASCULAR).

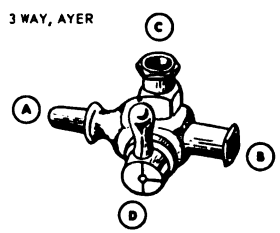
	From CMS: Parathoracentesis try (fig. 5–110).	The medical officer, using aseptic technique and following local anesthesia, introduces a sterile needle or other cannula into a body cavity or tissue space. He then aspirates (taps) accumulated fluid for either diagnostic, therapeutic, or both purposes.	1. Obtain and set up required equipment. 2. Tell patient what is to be done, giving appropriate information and reassurance to obtain his cooperation. 3. Take and record baseline vital signs before procedure. 4. Assist with procedure and recording of data as the medical officer directs. 5. Watch patient for any changes in color, pulse, or respiration. 6. Take or send specimens to lab. 7. Care for patient postprocedure. 8. Care for equipment postprocedure.	These procedures are usually performed on the patient's home ward at the bedside, or in the ward treatment room. Although the procedure itself is performed only by the medical officer, the active assistance and participation of competent nursing personnel is required. There are many occasions when these procedures are done only when both professional and nonprofessional nursing assistance is available—before, during, and after treatment.
1. Lumbar puncture (spinal fluid aspiration).	From CMS: Sterile spinal puncture tray (fig. 5–111); sterile gloves. From Ward: Skin disinfectant; local anesthetic agent; alcohol sponge container; transfer forceps; mobile table; stool (for doctor); holder for specimen; tubes (jar or glass); paper and pencil; adhesive tape; SF 514H; 3 labels.	Position of Patient: 1. Turned on his side, near edge of bed or treatment table, with his back toward the operator. *2. Back area skin exposed from buttocks to neck. 3. Knees drawn up to abdomen, chin drawn down to chest; shoulders and hips in same vertical plane. Procedure: 1. Lumber area *is prepared with skin disinfectant and draped. **2. Local anesthetic is injected. 3. Lumbar puncture needle is inserted into subarachnoid space of spinal canal. 4. Stylet of needle is withdrawn and fluid flow observed. 5. 3-way stopcock is inserted into needle hub, and manometer is attached. 6. Pressure of fluid is noted in manometer, and data is recorded. 7. Specimens are collected into test tubes and handed to assistant.	1. Assemble equipment at treatment site. 2. Set up sterile field on mobile table for convenience of operator. 3. Place stool on operator's side of bed. 4. Assist with placing patient in position and then, standing on side of the bed toward which patient is facing, hold him as necessary to maintain position. Do this by slipping your forearms behind the patient's flexed neck and knees to remind him not to attempt to straighten out. 5. Encourage patient to relax his muscles and to breathe slowly through his mouth. 6. Watch patient's color, pulse, and respiration throughout procedure. 7. Record data on worksheet at direction of doctor. 8. Receive and label specimens, identifying them as No. 1, No. 2, and No. 3. Set specimen tubes upright in holder provided. Be sure tubes are	 1. Slip connector (a) to needle hub. 2. Lock connectors (b and c) to manometer and syringe. 3. Handle (d) always toward closed port; e.g., in illustration. manometer port is closed, needle and syringe ports are open and in communication.

Table 5-8. Assisting With Diagnostic Tests and Collection of Specimens—Continued

Specimen /test	Equipment	Method of collection: General Instructions	Duties of medical specialist	Remarks
		8. Needle is withdrawn and dry dressing applied to puncture site. *Shave lumbar area as directed, p.r.n. **Review thoracentesis procedure, for assisting with local anesthetic.	securely capped or corked. 9. After treatment, assist patient to move to supine position in center of bed. Caution him to remain flat, on bed rest, for 24 hours, or as ordered. 10. Take or send specimens to laboratory at once. 11. Remove equipment from treatment site. Discard all linen in laundry hamper, discard all disposables in waste receptacle. Rinse manometer needles, and stopcock in cold water. Reset manometer in rack to prevent breakage. Return tray to CMS. 12. Record procedure on DD 640, Nursing Notes.	1. Spinal manometer, 2-part; metal rack protector used for sterilization and wrapping. 2. Luer lock end of manometer (a) of illustration is attached to Luer-lock connector of stopcock. When pressure level is very high, extension of manometer (b) is used.
2. Abdominal paracentesis (ascitic fluid).	From CMS: Sterile paracentesis tray (figs. 5-110 and 5-112); sterile gloves. From Ward: Large rubber sheet; bed sheet; pail or gallon bottle; transfer forceps; alcohol sponges; skin disinfectant; local anesthetic vial; emesis basin; mobile table; stool for doctor; footstool; pillows, 2 or more; SF 514-M; labels; sterile ABD pad; scultetus binder; safety pins; adhesive tape.	Position of Patient: Seated upright in a chair at bedside, or seated on side of bed, facing operator. Abdomen from waist to groin is exposed. Procedure—The doctor usually performs the procedure in the following sequence: 1. Skin preparation antiseptic. Shave abdomen from umbilicus to groin, if necessary. 2. Sterile draping. 3. Local anesthetic injected. 4. Small incision made through skin into abdominal wall in area below umbilicus. 5. Insertion of trocar and cannula. 6. Withdrawal of trocar for fluid drainage. 7. Direction of fluid into specimen bottle and then into drainage receptacle. 8. Withdrawal of cannula. 9. Skin suture p.r.n. 10. Dry dressing to incision.	1. Obtain equipment and assemble at bedside. 2. Tell patient what is to be done, giving appropriate information and reassurance. 3. Weigh patient. Record weight. 4. Take and record vital signs. 5. Have patient void. Record time and amount. Having the patient void immediately before the procedure is of critical importance, to avoid puncture of a distended urinary bladder. If the patient is unable to void, check for catheterization order. 6. Set up sterile field. 7. Place stool for doctor to sit on, facing patient, at side of bed. Place drainage receptacle on a footstool. 8. Assist patient in position supporting back with pillows and feet on chair seat if on side of bed; assist patient to sit upright in chair if out of bed. 9. Remove pajama trousers, if worn, draping genitalia with a	Paracentesis is a surgical puncture of a cavity for the aspiration of fluid; the term is used in referring to puncture of any body cavity. Abdominal paracentesis is done to relieve severe ascites, the accumulation of fluid in the abdominal cavity. (Pleural paracentesis is another term for thoracentesis) Ascites may develop as a complication of severe congestive heart disease or chronic liver disease; as the fluid accumulates, the abdomen becomes greatly distended ("tight as a drum") and the pressure on abdominal organs and the diaphragm impairs digestion and breathing. The procedure is done only when ascites is not relieved by medical means; for example, by low sodium diet and diuretic drug therapy to control fluid retention. Patients requiring paracentesis are both acutely and chronically ill and require

			towel. Drape covered, rubber sheet over patient's thighs and knees. 10. Assist doctor, as directed. 11. Watch patient's pulse and color—with release of fluid there may be circulatory changes. 12. After treatment, assist patient to comfortable dorsal position. Apply ABD pad and scultetus binder, as directed, if support to abdomen is required. 13. Remove equipment. Measure fluid in a graduate and record amount. 14. Weigh patient as soon as possible after treatment and record weight. 15. Send labeled specimen to laboratory. 16. Return equipment to CMS. 17. Observe patient for vital signs and incision area for any seepage. Reinforce dressing p.r.n.	expert nursing care at all times.
3. Joint aspiration.....	From CMS; Sterile aspirating tray; sterile gloves. From Ward: Transfer forceps; skin disinfectant; local anesthetic agent; vial of drug for joint instillation p.r.n.; elastic bandage p.r.n., SF 514–M.	Position of patient: Most comfortable possible to provide full support and exposure of joint to be aspirated. Procedure: The doctor usually performs the procedure in the following sequence: Applies skin disinfectant. Drapes area. Injects anesthetic. Inserts aspiration needle. Collects specimen. Instills medication p.r.n. Directs positioning of aspirated joint.	1. Obtain and assemble equipment at bedside or in ward treatment room. 2. Provide support for joint to be aspirated, as directed by doctor. 3. Set up sterile field. 4. Assist doctor as directed with treatment and application of bandage, if used. 5. Send or take specimen to laboratory stat. 6. Assist patient to maintain required position. This is usually with the joint at rest but in a position of function.	Sterile needle aspiration of fluid from a joint cavity is usually less traumatic than an incision and drainage of the joint. Fluid accumulation in a joint cavity may be the result of trauma, with consequent inflammation and exudation of fluid, as in "water on the knee." It may also be the result of infection, with purulent exudate. A hormone drug, such as hydrocortisone, may be instilled to relieve inflammation. An antibiotic or other chemotherapeutic drug may be instilled to combat infection.
K. SYSTEMIC VENOUS PRESSURE MEASUREMENT AND CIRCULATION TIME.	From CMS: Sterile venous pressure tray, sterile gloves. From Ward: Skin preparation tray; local anesthesia p.r.n.;	Position of Patient: Usually recumbent, with right arm elevated to level of the heart and supported on a	1. Obtain equipment and assemble at bedside. 2. Position patient so that right forearm is available for	The venous pressure test is one of many cardiovascular function tests. It is the measurement of the pressure exerted by the

Table 5-8. Assisting With Diagnostic Tests and Collection of Specimens—Continued

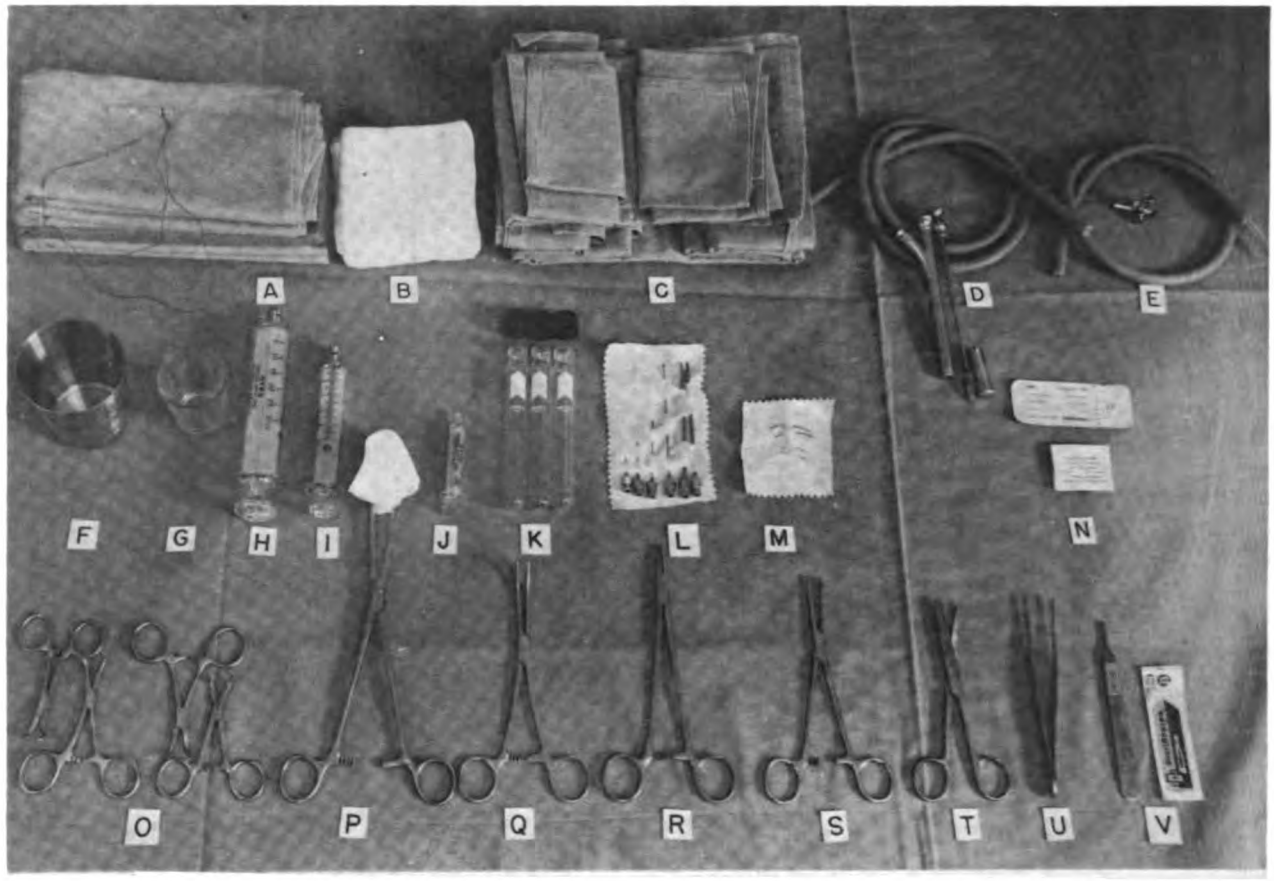
Specimen /test	Equipment	Method of collection: General Instructions	Duties of medical specialist	Remarks
	ampule of sterile normal (0.9 percent) saline, for IV, small protective sheet and cover; tourniquet; ampule file; pencil and paper; stopwatch. Drugs: IV preparation as ordered for circulation time—may be sodium dehydrocholate (Decholin) for arm-to-tongue test.	pillow. Procedure: The doctor usually performs the procedure in the following sequence: 1. Skin prep, usually right antecubital fossa. 2. Needle, stopcock, and syringe assembled. 3. Sterile sodium chloride drawn into syringe. 4. Venipuncture done. 5. Tourniquet released. 6. Manometer attached to free port on stopcock. 7. Stopcock handle adjusted and blood-saline mixture in syringe run into manometer. 8. Stopcock adjusted so that needle in vein and manometer communicate. Pressure reading taken when this level stabilizes in manometer. 9. If circulation time is to be determined, the needle is left in place in the vein and the syringe containing the IV drug solution is exchanged for the one which contains the saline solution.	venipuncture. 3. Place protective cover under arm. 4. Place tourniquet in position but do not apply the tourniquet until so directed by the doctor. 5. Assist as directed by the doctor—this may include preparation of saline and drug ampules or vials for withdrawal of contents; release of tourniquet; recording venous pressure and circulation time.	circulatory blood against venous walls. Venous pressure is usually elevated in congestive heart failure and other conditions causing obstruction of venous circulation. Normal venous pressure is much lower than arterial pressure and is customarily measured by means of a water (spinal) manometer in millimeters (mm.) or centimeters (cm.) of water pressure. The normal range is 6 to 12 cm. of water. Circulation time is measured to determine rate of blood flow. It is usually done immediately following determination of venous pressure by arm-to-tongue test. A drug with a strong, distinctive taste is injected intravenously by the doctor and circulation time is determined, with a stopwatch, from the moment the drug is introduced into the vein until the patient is aware of the taste. The patient must know what to expect—the doctor tells him exactly how he is to signal in order to assist with timing.
L. NEEDLE BIOPSY OF LIVER.	Liver biopsy tray from CMS: sterile gloves; local anesthetic vial; skin prep tray; transfer forceps; SF Form 522 (signed); SF 515 (Tissue Examination); specimen jar with fixative from laboratory; band-aid dressing.	Position of the Patient: 1. With the bed flat, the patient lies on his back, as near to the right side (patient's right) as possible. 2. Chest and abdomen are exposed. 3. Right arm is above head in comfortable position. Procedure: 1. The doctor instructs the patient on maintaining required position, controlling his breathing, etc. 2. The doctor disinfects skin,	1. Obtain equipment. 2. Check to see if SF Form 522 has been signed and inserted in clinical record. 3. Withhold food and fluids 4 hours prior to procedure. 4. Take and record vital signs. 5. Position patient. 6. Set up sterile field. 7. Assist with procedure as directed. 8. With an assistant, lift patient gently back into center of bed after biopsy. 9. Caution patient to remain	Needle biopsy of the liver is done to evaluate the effects of liver disease on liver tissue. By means of a special, 3-part biopsy needle, a minute core of liver tissue is obtained for microscopic examination. Because in liver disease there is a possibility of a bleeding tendency, the patient will have had extensive hematology studies completed prior to biopsy to include hemoglobin, bleeding time, clotting time, platelet count, etc.

		applies drapes, and anesthetizes the area. 3. He inserts the biopsy needle, obtains specimen, and places the specimen in the specimen jar. 4. He applies a small (may be Band Aid), dry dressing to puncture site. Specimen: Hand-carried to pathology section of laboratory.	flat for 6 hours, or time directed by doctor. Complete bed rest is continued for 24 hours. All exertion must be avoided, and any movement must be minimal. 10. Take and record vital signs q. 15 min. for 1 hour, and then q. 2h for the next 12 hours. Notify the doctor stat. of increase in pulse rate, drop in BP, pain in RUQ (there will be soreness). 11. Assist patient with meals, hygiene, etc., while complete bed rest is continued.	The complication to be alert for after liver biopsy is internal hemorrhage. The small puncture site and dressing are deceptive, and patient and personnel must be informed of the importance of complete bed rest and close observation.
M. ENDOSCOPIES: 1. Cystoscopy (IV pyelogram). (genitourinary examination).	Check doctor's orders. For preparation of patient: Enema tray; Hypnotic if ordered; "No breakfast" sign for patient's bed; SF 522 signed.	Examination is done in cystoscopy room. Cystoscope is inserted into urinary bladder, ureteral catheter into fundus of kidney. Dye is given IV; X-ray pictures are taken.	Send request, make appointment. Preparation of patient. 1. Cleansing enema night before examination. 2. Give cathartic if ordered. 3. Omit breakfast on day of examination. 4. Give hypnotic if ordered. 5. Provide transportation (stretcher). 6. Send chart with patient. After treatment: 1. Serve breakfast. 2. Force fluids. 3. Be alert for signs of pain or discomfort.	The cystoscopy room may be part of the OR or in a special GU clinic area.
2. Bronchoscopy; Bronchography (thoracic examinations).	For preparation of patient: Nothing by mouth; Hypnotic if ordered; "Nothing by mouth" sign for patient's bed; SF 522 signed.	Examination is done in bronchoscopy room or operating room. Bronchoscope is inserted into trachea and large bronchi. Mucous membrane is visualized. *Note.* Local anesthetic is instilled and patient will not have protective swallow reflex until anesthesia has worn off.	Send request, make appointment. Preparation of patient: 1. Nothing by mouth 4 to 6 hours before examination. 2. Give hypnotic if ordered. 3. Provide transportation (stretcher). 4. Send chart with patient. After treatment: 1. Nothing by mouth until anesthesia has worn off. 2. Be alert for signs of pain, discomfort, or respiratory distress.	A bronchogram may be ordered in connection with the bronchoscopy. A radiopaque dye is instilled into the bronchi. When this has been done, postural drainage is an important part of posttreatment.

Table 5–8. Assisting With Diagnostic Tests and Collection of Specimens—Continued

Specimen /test	Equipment	Method of collection: General Instructions	Duties of medical specialist	Remarks
3. Proctoscopy (follow same procedure for sigmoidoscopy). (Rectal examination).	(Check doctor's orders). For preparation of patient: Enema tray; Hypnotic if ordered; "No breakfast" sign for bed or tray; Light supper; SF 522 signed.	Examination is done in the proctoscopy room. Protoscope is inserted into rectum; mucous membrane is visualized. Female patients must be chaperoned by female personnel.	Send request, make appointment. Preparation of patient: A. Evening before examination: 1. Light supper. 2. Cleansing enema. B. Morning of examination: 1. Cleansing enema until returns are clear. 2. Omit breakfast. 3. Give hypnotic if ordered. 4. Provide transportation (stretcher). 5. Send chart with patient. After treatment: 1. Serve meal. 2. Be alert for signs of pain or discomfort.	
N. BASAL METABOLISM RATE (BMR).	Special BMR room or on ward in a quiet room, screened area; Request Form 514–I; "No breakfast" sign for patient's bed. Omit medications.	Test is taken by technician. Patient lies quietly in bed, breathes through BMR apparatus. Respirations are recorded on graph.	Take height, weight, age, record on request form. Send request to BMR room for appointment. Tell patient to remain in bed from bedtime (2100 hours) until after test in a.m. and to take nothing by mouth after 2100 hours. No smoking. Delay AM care and breakfast until after test. Provide transportation to BMR room at scheduled hour. After treatment: Serve breakfast.	The BMR test measures the rate of oxygen utilization under basal conditions—that is when the patient is at complete physical and mental rest.
O. ELECTRICAL IMPULSES: 1. Electrocardiograph (ECG) (EKG).	Special ECG room or bed in ward. Request SF Form 520.	Patient lies quietly in bed. Leads are fastened to various parts of body. Electrical impulses are recorded on graph.	Take height, weight, age; record on request. Send request for appointment. On ward: • Reassure patient. • Fold top covers to foot of bed. • Loosen pajama coat. • Assist technician if necessary. In ECG room: provide transportation to room.	

2. Electroencephalogram (EECG).	Special EECG room. Request form.	Leads are fastened to various parts of the head. Electrical impulses are recorded on graph.	Send request to EECG room, make appointment. Provide transportation.	
P. X-RAY EXAMINATIONS:				
1. Chest (routine)	SF 519A	Taken by X-ray technician in X-ray department.	*Note.* No special preparation of patient.	With the exception of the routine chest X-ray or the portable chest X-ray, almost all diagnostic examinations by X-ray require preliminary preparation of the patient. Local directives must be followed. In general, these rules apply: (1) If examination requires enemas or cathartics, these orders must be written by the ward medical officer. (2) If preparation includes enema administration, the success of the examination may depend upon proper cleansing of the bowel. When so ordered, the enema procedure should be completed at least 2 hours prior to examination. (3) If preparation includes dietary and fluid restriction, the patient must be fully instructed, as well as food service notified.
2. Chest (portable)	SF 519A—write "portable" on form.	Taken by X-ray technician who brings portable apparatus to patient's bedside.	1. Send ambulatory patient, or transport bed patient, on call to X-ray. 2. Assist X-ray technician as necessary to position and support the patient. The technician will give all instructions to the patient and to the assistant.	
3. Abdominal and special series.	SF 519A	Taken by X-ray technician, X-ray department. By appointment at scheduled hours.	Follow specific local X-ray department directive, and orders written by attending physician for X-ray studies such as— Abdomen KUB (Kidneys, Ureters, Bladder) Spine Gastrointestinal Series (GI) Gallbladder Series (GB)	



USES: TO REMOVE FLUID FROM THE PLEURAL OR ABDOMINAL CAVITIES. TO RELIEVE PAIN; TO SECURE A SPECIMEN FOR DIAGNOSTIC PURPOSES; TO INSTILL MEDICATION.

A 4 HAND TOWELS

B 8 SPONGES, SURGICAL, 4 X 4 PLAIN

C 1 DRAPE SHEET

D 1 TROCAR

1 LATEX TUBING, 3/16 INCH INSIDE DIAMETER, 30 INCH LENGTH

E 1 LATEX TUBING, 3/16 INCH INSIDE DIAMETER, 10 INCH LENGTH, WITH STOPCOCK, 3 WAY, AYER, AND GLASS NEEDLE ADAPTER

F 1 CUP, SOLUTION

G 1 MEDICINE GLASS

H 1 SYRINGE, 30 ML, LUER LOCK

I 1 SYRINGE, 10 ML, LUER LOCK

J 1 SYRINGE, 2 ML

Figure 5–110. Para-thoracentesis tray.

K 3 TEST TUBES, SCREW CAP, CULTURE

L 1 NEEDLE, HYPODERMIC, 25 GAGE, 5/8 INCH

1 NEEDLE, HYPODERMIC, 22 GAGE, 1 INCH

1 NEEDLE, HYPODERMIC, 19 GAGE, 1 3/4 INCH

1 NEEDLE, HYPODERMIC, 17 GAGE, 3 INCH

1 NEEDLE, HYPODERMIC, 15 GAGE, 1 1/2 INCH

1 NEEDLE, HYPODERMIC, PNEUMOTHORAX, 13 GAGE, 3 1/2 INCH

M 2 NEEDLES, SUTURE, SURGEON, REGULAR, 3/8 CIRCLE, CUTTING EDGE, SIZE 12

2 NEEDLE, SUTURE, SURGEON, REGULAR, 3/8 CIRCLE, CUTTING EDGE, SIZE 16

N 1 SUTURE, BLACK SILK, 000

1 SUTURE, BLACK SILK, 0

O 4 FORCEPS, TOWEL BACKHAUS (SMALL TOWEL CLIP), 3½ INCH

P 1 FORCEPS, GAUZE PAD HOLDING, FOERSTER (SPONGE FORCEPS) STRAIGHT, 9½ INCH

Q 1 FORCEPS, HEMOSTATIC, ROCHESTER-PEON (CURVED KELLY), CURVED, 6¼ INCH

R 1 HOLDER, SUTURE NEEDLE HEGAR-MAYO, 7 INCH

S 1 FORCEP, HEMOSTATIC, KELLY (CRILE), STRAIGHT, 5½ INCH

T 1 SCISSORS, GENERAL SURGICAL, ONE POINT SHARP, STRAIGHT, 5½ INCH

U 1 FORCEPS, TISSUE, STRAIGHT, 5½ INCH

V 1 HANDLE, SURGICAL KNIFE, #3

1 BLADE, DETACHABLE, #15

TRAY SIZE: 15½ X 9½ X 2 INCHES

HAND TOWEL TO LINE TRAY

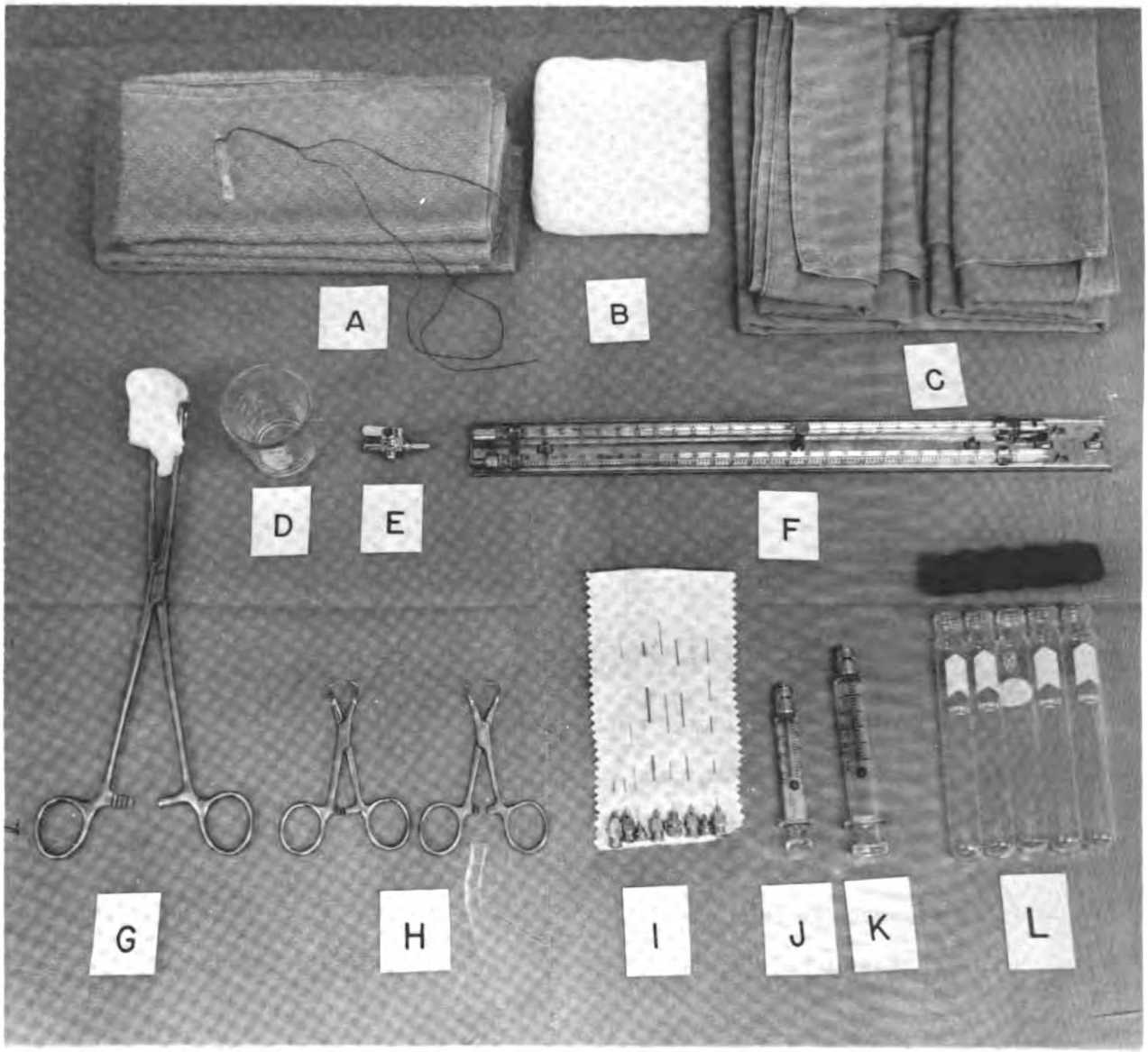
WRAPPER SIZE: 36 X 36 INCHES

STERILIZATION INDICATOR

NOTE: A STERILE 500 ML GRADUATE, BOWEL, SURGICAL SPONGE STEEL, OR WASH-BASIN SHOULD ACCOMPANY TRAY FOR AN EXCESSIVE AMOUNT OF FLUID.

PARA-THORACENTESIS TRAY

Figure 5–110.—Continued.



USES: TO OBTAIN SPECIMENS OF FLUID FOR ANALYSIS; TO RELIEVE INTRACRANIAL PRESSURE

Figure 5–111. Spinal puncture tray.

A 2 HAND TOWELS

B 5 SPONGES, SURGICAL, 4 X 4 PLAIN

C 1 DRAPE SHEET

D 1 MEDICINE GLASS

E 1 STOPCOCK, 3 WAY, AYER

F 1 MANOMETER, SPINAL FLUID

G 1 FORCEPS, GAUZE PAD HOLDING, STRAIGHT, FORESTER, 9½ INCH

H 2 FORCEPS, TOWEL, BACKHAUS (SMALL TOWEL CLIP), 3½ INCH

I 1 NEEDLE, HYPODERMIC, 25 GAGE, 5/8 INCH

1 NEEDLE, HYPODERMIC, 22 GAGE, 1½ INCH

1 NEEDLE, SPINAL PUNCTURE, 22 GAGE, 3½ INCH

1 NEEDLE, SPINAL PUNCTURE, 20 GAGE, 3½ INCH

1 NEEDLE, SPINAL PUNCTURE, 18 GAGE, 3½ INCH

J 1 SYRINGE, 2 ML, LUER LOCK

K 1 SYRINGE, 5 ML, LUER LOCK

L 5 TEST TUBE, SCREW CAP, CULTURE

TRAY SIZE: 19¼ X 12¾ X ¾ INCHES

HAND TOWEL TO LINE TRAY

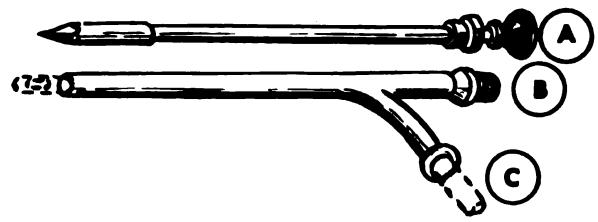
WRAPPER SIZE: 48 X 48 INCHES

STERILIZATION INDICATOR

NOTE: TRAY MAY ALSO BE USED FOR PNEUMONENCEPHALOGRAPHY. FOR PEDIATRICS, SPINAL PUNCTURE NEEDLE, 22 GAGE, 1½ INCH, AND 20 GAGE, 2 INCH, MUST ACCOMPANY THE TRAY.

SPINAL PUNCTURE TRAY.

Figure 5–111—Continued



(A) TROCAR – THIS SHARP-POINTED INSTRUMENT IS USED WITH THE CANNULA FOR PIERCING THE ABDOMINAL WALL.

(B) CANNULA.

(C) THE SIDE ARM OF THE CANNULA MAY BE USED FOR ATTACHMENT OF A DRAINAGE TUBING, AS IN PARACENTESIS. IN OTHER TREATMENTS, A CATHETER MAY BE INTRODUCED, AS INDICATED IN THE DIAGRAM,TO REMAIN IN THE DRAINAGE AREA.

Figure 5–112. Trocar and cannula set (paracentesis).

CHAPTER 6

OUTPATIENT MEDICAL CARE

Section I. INTRODUCTION TO OUTPATIENT SERVICE FACILITIES

6-1. Dispensaries

A dispensary is a medical treatment facility designed primarily to provide outpatient examination and care for ambulatory patients, to treat emergency cases, and to arrange for admission to a hospital of patients requiring inpatient care. Dispensaries also perform various administrative, preventive medical, and sanitary activities related to the health of the personnel served. In general, the term "dispensary" designates a facility situated away from the immediate vicinity of a hospital; the term "outpatient clinic" is used for a unit of the hospital that provides medical service primarily for nonhospitalized patients; and the term "aid station" designates a unit dispensary providing primary medical care for troops in the field when the dispensary is operating in a combat zone or under simulated combat conditions. All of these medical treatment facilities are commanded by an officer of the Medical Corps.

6-2. Types of Dispensaries

a. Fixed Dispensaries. A fixed dispensary is a medical treatment facility operated by table of distribution and allowance (TDA) units. They are fixed dispensaries because they are intended to operate in the same location over a long period of time. A fixed dispensary is designed to provide medical service for personnel located in an Army installation, a large city, a military district, or a prescribed geographic area. These dispensaries are operated under the Medical Department Activity (MEDDAC) concept in accordance with AR 40-4. Under this concept, the dispensaries have a direct relationship to a designated parent medical service activity; they are a subordinate unit of the Department of Clinics of a designated U.S. Army hospital. A fixed dispensary located on an installation that has a U.S. Army hospital is designated by number; for example, "Dispensary number 1", a fixed dispensary located on an installation that does not have an Army hospital is designated as "U.S. Army Dispensary."

b. Mobile Dispensaries. Mobile (nonfixed) dispensaries can move or be moved from place to place to provide medical support in tactical operations. These dispensaries are operated by cellular or specialist units (table of organization and equipment—or TOE—units) having a team designation as follows:

(1) Teams MA, MB, and MC operate dispensary units in the communications zone. They are assigned to a theater army support command (TASCOM) and are employed on the basis of a specified troop population and the availability of nearby hospital facilities. Team MA is considered 40-percent mobile and could operate a dispensary designed to serve a troop population of 1500 to 3000. Team MB is considered 25-percent mobile and could operate a general dispensary designed to serve a troop population of 2000 to 5000. Team MC is considered 15-percent mobile and could serve a troop population of 5000 to 10,000. Qualified specialized personnel assigned to these respective teams enable each to organize operation of the dispensary into sections, which can provide services as shown below:

Section	Team MA	Team MB	Team MC
Dental	Yes	Yes	Yes
Surgical	Yes	Yes	Yes
Medicine	Yes	Yes	Yes
EENT	Yes	Yes	No
Laboratory	No	Yes	No
Pharmacy	Yes	Yes	Yes

(2) Team OA operates as a medical detachment with the primary mission of providing dispensary-type medical service for troops who do not have unit medical service. These teams are allocated on the basis of 1 per 1000 troops. The team is considered 100-percent mobile, as the organic vehicles authorized are sufficient to move the personnel and equipment of the unit.

6-3. Mission and Activities of Dispensaries

a. Dispensaries are the first level of medical service for all military personnel except those troops actually engaged in combat operations.

Under combat or simulated combat conditions, first-level medical service for troops is provided in aid posts and aid stations (para 6–35). Dispensaries are not merely first aid or sorting stations, nor are they miniature hospitals; they provide proper diagnosis and treatment for patients or transfer them to the hospital for inpatient care. The majority of patients seeking medical care do so because of minor sickness, injury, or concern over personal health. If these individuals are returned to duty from the dispensary level without adequate examination, treatment, and reassurance, they continue to worry about their health, lose confidence in the Army Medical Department, and become less effective in their assignments. On the other hand, if they are needlessly hospitalized, duty time is lost unnecessarily and hospital personnel and facilities are used needlessly.

b. The importance of professional medical care and good interpersonal patient relationships in dispensary-level facilities cannot be overemphasized or exaggerated; a well-organized and efficiently operated dispensary is one of the most effective means of providing and extending medical service to the military community.

c. Some of the more important activities carried on by a dispensary are: (1) sick call; (2) emergency treatment; (3) continuing routine treatments or a series of treatments for patients who do not require hospitalization; (4) immunizations; (5) physical examinations; (6) sanitary inspections related to the health of personnel served; (7) maintenance of individual health records; and (8) in some dispensaries, provision of medical and nursing care and observation of quarters-status patients who are admitted to the patient care bed unit of the dispensary.

6–4. Dispensary Personnel

a. General. For dispensary facilities operating under TDA units, the size of the staff depends on the workload and the number of hours each week that the dispensary is open.

b. Personnel.

(1) *Dispensary surgeon.* The senior medical officer assigned to a dispensary is designated the dispensary surgeon. The surgeon is responsible for:

(*a*) Diagnosis, treatment, and disposition of all persons coming to the dispensary for medical care.

(*b*) Administration of the dispensary, including personnel, property, supplies, and records.

(*c*) Command function over personnel of the dispensary so far as pertains to the direct operation and efficiency of the dispensary. He is responsible for the adequate care and discipline of individuals coming to the dispensary while they are under his jurisdiction.

(*d*) The dispensary pharmacy and its operation.

(*e*) Maintenance of records and transmittal of reports as required.

(*f*) Such miscellaneous functions of the dispensary and its personnel as may be required. He also works in cooperation with the post or unit preventive medicine officer on matters relating to infectious disease incidence and control.

(2) *Assistant dispensary surgeons.* When more than one medical officer is assigned to a dispensary, the additional doctors are designated as assistant dispensary surgeons. Their duties are assigned by the dispensary surgeon.

(3) *Administrative officer.* Often the personnel of a dispensary includes a Medical Service Corps officer who serves as the administrative officer. This officer's duties are assigned by the dispensary surgeon. Usually he is put in charge of the administration of the dispensary, including personnel management, records, reports, property, and supplies.

(4) *Army Nurse Corps officer.* One or more members of the ANC may be assigned to a dispensary. This is determined, to a large extent, by the complexity of medical treatments provided and the population served by the dispensary. Duties and responsibilities of the ANC officer include performance of selected treatment procedures and overall supervision and coordination of nursing activities, including personnel in-service and on-the-job (OJT) training and patient education.

(5) *Chief dispensary medical specialist (MOS 91B40).* The chief dispensary medical specialist is the NCO in charge. He is responsible to the dispensary surgeon (and to the ANC officer, when one is assigned) for the conduct of nonprofessional duty personnel and enlisted patients; cleanliness, order, and physical maintenance of the dispensary and its equipment; instruction and supervision of dispensary specialists, assistants, and attendants in the care and treatment of patients and other work; estimation of supply needs and requisition of supplies; and maintenance of property records. He also assists the doctor (or nurse) in administering medications and treatments.

(6) *Clinical specialist (MOS 91C20).* The clinical specialist applies advanced nursing care principles, procedures, and techniques in the care and treatment of patients independently, or he may be under the general supervision of the physician or nurse. He assists the medical officer with minor surgical and other therapeutic and diagnostic procedures under hospital or field conditions. He may also function as a chief dispensary medical specialist ((5) above).

(7) *Dispensary medical specialists (MOS 91B20, 91B40) and medical corpsman (MOS 91A10).* These personnel are responsible, at their respective levels of training and experience, through the NCO in charge, to the dispensary surgeon (and ANC officer, when assigned) for assisting with patient care as directed and for assisting with the cleanliness, order, and physical maintenance of the dispensary.

(8) *Pharmacy specialist (MOS 91Q20).* This specialist is charged with the operation of the dispensary pharmacy. He compounds and dispenses medications under the general supervision of a pharmacy officer or the dispensary surgeon, or both.

(9) *Clerk (MOS 71L20 or 71L40).* This clerk performs clerical and related duties. He is in charge of medical records and assists in the preparation of records and correspondence.

(10) *Civilian personnel.* Civil service personnel, as well as citizens of a host country (local national) or other non-U.S. citizens, may be employed by the U.S. Army for work in dispensaries and outpatient clinics. They may be employed as doctors, graduate nurses, practical nurses, nursing attendants, or in any other authorized position. Their duties and responsibilities are determined by the job description of the position for which they are employed.

c. Personnel Policies. Written personnel policies, dated and signed by the dispensary surgeon, should be established for each dispensary. All personnel on duty should be acquainted with and have access to these policies. Included in the policy statement should be information on—

(1) Hours of duty.
(2) Duty uniform.
(3) Meals (where and when).
(4) Leaves and passes.
(5) Illness and accidents.
(6) Command information program.
(7) Training program.

d. Orientation. An orientation helps a newly assigned individual to develop a feeling of belonging and to acquire the information and skill needed to function efficiently in the shortest possible time. The amount of time needed will vary according to the individual's experience and training. Special points to be included in the orientation are as follows:

(1) *Orientation to the unit.*
(*a*) Description of services available.
(*b*) Physical setup.
(*c*) Location of supplies and equipment.
(*d*) Instruction on emergency equipment: location and how to use it.
(*e*) Fire and safety regulations.
(*f*) Time schedule.
(*g*) Assignment sheets.

(2) *Orientation to the administrative organization.*
(*a*) Introduction to all personnel.
(*b*) Chain of command.
(*c*) General policies.
(*d*) Clinic routine and SOP.

(3) *Orientation on the responsibilities of the individual.* This should cover what is expected of each individual. A major responsibility of ALL duty personnel is to make certain that medical facilities are safe places for patients and personnel. The patient is also entitled to the best possible care from fully qualified personnel.

e. Training. The primary purpose of training in a dispensary is the improvement of patient care. The objectives of this training are to prepare each soldier to function effectively in the MOS now held and then to prepare him to meet the requirements of the next higher skill digit of his MOS. Training for civilians should prepare them to function more effectively in their present positions.

NOTE

Doctors, nurses, and dispensary specialists must be acquainted with (1) the MOS specifications described in AR 611–201 for each MOS authorized and (2) with the job descriptions of local national employees. Each individual must have the opportunity to develop his full potentiality. Training should be planned to meet the specifications of the individual's primary MOS and the requirements of his present job. It should be practical

in nature—the individual should be told what to do, shown how to do it, and then given opportunity to practice under supervision until he can do the task safely and effectively.

This is accomplished for both military and civilian personnel by giving the individual an opportunity to—

(1) Improve old skills and to develop new ones.

(2) Acquire knowledge needed to function effectively in his assignment.

(3) Develop his abilities to function as a member of the patient care team.

f. Evaluation of Duty Performance.

(1) Work evaluation should be a constant process from the time the individual first comes on the job until he leaves. It should be based on what has been established as the work standards for his job.

(2) It is the individual supervisor's responsibility to help each soldier or civilian working under him to understand what is expected of him; to evaluate how he is doing; to help him to learn what to do and how to do it better; and to help him to develop. Each individual in an organization should know where he stands.

(3) A suggested plan for evaluation is shown below.

(*a*) Start when you orient. Build a good work relationship with the specialist and other nonprofessional personnel. Be sure each person knows what is expected of him and how to do it.

(*b*) Allow time for informal day-to-day talks. This is probably the most helpful kind of evaluation. Tell the individual what he is doing well. If he is doing something wrong, tell him in a matter-of-fact way that he is doing something one way when it is better to do it another way and why. Try to help the individual, rather than to "jump on him." Avoid criticizing one man in the presence of another.

(*c*) Plan private talks. Talk with the newly assigned person on a planned basis every few weeks about how he is measuring up to the job as a whole. Talk at planned intervals with men who have been on the job for a longer time. Go where you can talk undisturbed. Talk first about the things you like about the way he does his job. Then talk about the problems he has in performing some tasks. Talk about how to do them better. Be specific; show him; give examples. Let him express himself thoroughly and listen while he does.

(4) A summary evaluation should be made when the individual transfers to another job and when a written evaluation is required. This evaluation should be discussed with the individual concerned. If the supervisor has kept his men well informed, a summary evaluation will mean just another opportunity to talk to them.

6–5. Dispensary Physical Facilities

a. General. The dispensary may be located in a building planned for such use but often it is in one constructed for an entirely different purpose. The rooms or areas described in *b* below are usually needed to carry on the activities. The amount of space provided for each will depend on the building and the current workload. All available area must be used to the best possible advantage by—

(1) Providing adequate space for each activity.

(2) Planning for the least amount of unnecessary walking for personnel and patients.

(3) Avoiding bottlenecks in hallways and other common-use areas.

(4) Keeping noise to a minimum.

(5) Practicing preventive maintenance by day-to-day care, inspection, and first-echelon servicing of equipment and facilities. Corrective action should be initiated immediately to remove hazards to safety.

(6) Maintaining cleanliness of environment and work habits to prevent the spread of infection from one patient to another or from patients to personnel.

b. Arrangement of Dispensary. The following areas should be provided and clearly identified—

(1) *Appointment desk.* This is the clerk's work area. It should be near the entrance and be arranged for efficient registration of patients and maintenance of records.

(2) *Reception or waiting room.* This room is used by the patients and their families who are waiting for the doctor, for treatments, or for reports of tests. It should be near the appointment desk. It should be equipped with an adequate number of comfortable chairs; ash trays, if smoking is permitted; and a coatrack for overcoats. The area should be arranged as attractively as

conditions will allow and must be kept clean, orderly, and well ventilated.

(3) *Doctor's office.* Each doctor should have a private area in which to see patients. Handwashing facilities must be provided when the examination area is located in the doctor's office. Screens or curtains for privacy should be used when patients are dressing and undressing.

(4) *Examining area.* This is usually in or connected to the doctor's office. Minimum requirements include—

(*a*) Hand washing facilities.

(*b*) Table, examining, with pad.

(*c*) Light, floor (gooseneck lamp).

(*d*) Waste receptacle, sanette, step-on type.

(*e*) Stool, revolving, adjustable.

(*f*) Screen or curtain for privacy.

(*g*) Examination tray or supply table with equipment such as—

Otoscope/ophthalmoscope
Flashlight
Sphygmomanometer
Stethoscope
Mirror with headband
Hammer, reflex testing
Gloves (clean, for rectal examination)
Lubricant, surgical
Tissues
Paper towels
Tongue depressors, applicators, gauze pads
Slides, microscope
Culture tubes

(*h*) Bedsheet (to be on the table or readily available) and hand towel.

(*i*) Scales (since one per dispensary is usually allowed, the scales may be kept in the waiting room, for ready accessibility).

(5) *Treatment room.* The treatment room contains supplies and equipment required to carry out treatments prescribed by the doctor following his interview and examination of the patient. The level of supplies (type and quantity) should be established and posted; however, the treatment room should not be used as a general storage or supply area. Required furniture and equipment include—

(*a*) Hand washing facilities.

(*b*) Table, examining, with pad.

(*c*) Light, floor (gooseneck lamp).

(*d*) Cabinet, medicine, with locked compartment.

(*e*) Supply table or dressing cart.

(*f*) Waste receptacle, sanette, step-on type.

(*g*) Desk or table.

(*h*) Chair for specialist.

(*i*) Chair for patient.

(*j*) Refrigerator.

(*k*) Stand, irrigating.

(*l*) Stand, instrument (Mayo type).

(*m*) Cabinet with inclosed shelves for sterile supply level.

(6) *Minor surgery room.* When required, a room separate from the treatment room should be equipped and maintained ready for use in the same manner as an operating room. This room should be reserved for aseptic surgical procedures and should be used for no other purposes.

(7) *Emergency equipment area.* Emergency supply items must be readily available. The suggested location for this equipment is in the treatment room in a safeguarded but unlocked area, clearly identified with a sign "Emergency Equipment." Emergency equipment should include the following items—

(*a*) Oxygen cylinder strapped or secured on a carrier, with gage, humidifier, mask, and wrench attached. The equipment must be ready for use.

(*b*) Resuscitator-inhalator-aspirator apparatus (manual or mechanical unit) (para 6–16).

(*c*) Suction—aspirator apparatus.

(*d*) Airway, pharyngeal.

(*e*) Antianaphylaxis (emergency stimulant) tray.

(*f*) IV injection sets.

(*g*) IV injection solution, as prescribed.

(*h*) Tourniquet.

(*i*) Stand, irrigator.

(*j*) Poison antidote supplies.

(*k*) Gastric lavage tray.

(8) *Pharmacy.* A separate room for pharmacy operation is desirable. A safe, vault, closet, or other approved locked storage area for storing alcoholic liquors, narcotics, poisons, habit-forming drugs, and other controlled-distribution drugs is essential.

(9) *Centralized Materiel Section (CMS).* The space and equipment requirements will vary, depending upon whether the dispensary receives all sterile supplies from a parent hospital unit or

whether it must prepare and sterilize its own supplies.

(*a*) Units receiving sterile supplies from a hospital should provide separate storage spaces for sterile supplies, clean storage or utensils and technical equipment maintained by the unit, and a clearly designated area for used equipment to be returned to the hospital CMS.

(*b*) Units that prepare and sterilize their own supplies should set up and operate the section in accordance with TM 8–275. The total area provided must be adequate for a clearly defined work-flow, starting with an area for receiving used equipment and followed by an area for breaking down, sorting, washing, and sterilizing.

(10) *Utility room.* This area for general cleaning and sanitizing of utensils and similar equipment requires a sink, sanitizer for utensils, and a storage area for cleaning supplies.

NOTE

When space is limited, the utility room must often be used as the only available place for the soiled linen hamper, waste disposal can, mop and broom rack, etc. When used for such purposes, it is not an appropriate place for storing clean utensils and other clean but nonsterile equipment.

(11) *Patient care ("quarters") unit.* When the dispensary provides overnight or more prolonged accommodation for "quarters" patients, the unit is set up as a hospital ward. Each patient requires a bed, bedside stand, chair, and a locker or other facility for his clothing. In providing a patient care unit, consideration must be given to the need to define areas for—

(*a*) Nurses' station or office.

(*b*) Examining and treatment room.

(*c*) Food service area.

(*d*) Latrine and shower facilities for patients.

(*e*) Utility room.

6–6. Dispensary Equipment and Supplies

a. General. A dispensary will be provided with the equipment needed to carry on its activities. In some instances, equipment will be provided as prescribed in applicable tables of organization and equipment. In other instances, a dispensary may function with equipment prescribed by a table of authorization, or it may get its equipment by allocation from the commanding officer of the parent treatment facility. The local SOP on equipment and supplies, based on information contained in AR 735–35, should include—

(1) Responsibility.

(2) Source.

(3) Stock levels to be maintained.

(4) Procedure for ordering expendable and nonexpendable items.

(5) Procedure for obtaining emergency supplies.

(6) Procedure for turn-in of excess or unserviceable equipment.

(7) Maintenance responsibility of dispensary personnel (preventive or first echelon maintenance measures).

(8) Procedure for requesting repairs.

b. Expendable and Nonexpendable Property. Property is a term which encompasses all supplies, equipment, instruments, and other materials having monetary value. Property is classified as expendable or nonexpendable. Accounting procedures differ for each classification. Economy in use is essential for either classification.

(1) *Nonexpendable property.* These are items costing over $10.00 which are not consumed in use and which ordinarily retain their original identity during the period of use. Nonexpendable property is accounted for in the property book.

(2) *Expendable property.*

(*a*) These are items which are consumed in use. All medical items of a value of $10.00 or less are automatically considered expendable; those having a value in excess of $10.00 must be officially declared expendable by The Surgeon General of the Army.

(*b*) Two terms used in describing expendable items are "consumable" and "durable." Consumable items are not durable in nature and cannot be reused for the same purpose. Examples are drugs, solutions, and dressings. Durable items do not lose their identity when used and can be reused for the same purpose. Examples are surgical instruments and linen.

(*c*) Formal inventories of expendable property are not required by regulations; however, inventories should be made in preparing periodic requisitions to maintain authorized stock levels properly.

c. Supply Levels. Reasonable supply levels for each expendable item of supply must be established at unit or dispensary level to enable the supply system to function properly. The level for each item should be the amount or number of that

item that normally is used within a given period of time or requisition period. The medical supply officer will determine from usage factors the amount of each item expected to be used within a requisitioning period and will increase this usage factor to include a level to assure sufficient supply until a requisition is filled. This figure is the maximum level of supply or the maximum quantity of each item authorized to be on hand or on requisition at any one time.

(1) Initial stock levels for TOE units are established by the TOE itself.

(2) Levels of supply should be examined and adjusted periodically because usage factors change as personnel, mission, and workloads vary.

d. Guides for Equipment Care and Maintenance. Equipment maintenance by the user (preventive or first-echelon maintenance) is an essential element of supply economy. The following recommendations are guides in care and proper maintenance of equipment:

(1) Have on hand and be familiar with the manufacturers' operating instructions and military operation manuals. Keep these in a clearly identified file.

(2) Upon receipt of new equipment, incorporate pertinent instructions into local user and maintenance SOP.

(3) Set up a daily schedule for maintenance as a routine part of the day's duties. Routine inspection and operational checking of equipment will reveal the need for making minor replacements of parts; *for example,* rubber tubing, batteries, and light bulbs.

(4) Keep equipment clean. Remember that different kinds of equipment require different care; however, the habitual use of an appropriate wiping cloth to keep equipment free of dust can and does cut maintenance costs and effort.

(5) Follow the manufacturer's instructions for periodically oiling or lubricating moving parts.

(6) Tag unserviceable equipment conspicuously and turn in as promptly as possible. Find out from the local supply officer the policy established for both issue and turn-in equipment. Use DD Form 1150–1 for requesting items from the medical supply officer.

Section II. ROUTINE GENERAL ACTIVITIES

6–7. Routine Dispensary Duties

The dispensary must be kept ready so that patients can be received and treated in a clean and orderly environment. A common and workable method is to establish an SOP for daily and periodic routine duties that will not interfere with a smooth, uninterrupted flow of patients and that will take advantage of periods when the unit is free of patients. Each individual should have an assigned area of responsibility, to include treatment rooms, examining rooms, and rooms in common use such as waiting room, latrines, and corridors.

a. Daily Measures.

(1) At the beginning of the day and before treatment of patients begins, air the dispensary; check emergency equipment, sterilizers, and treatment area supply levels (drugs, linen, instruments, utensils); check handwashing facilities for soap and paper towels; make a final check for dust and for orderly arrangement of equipment.

(2) As a concurrent measure throughout the day, check examining and treatment rooms after each use, to include removing all soiled linen, instruments, and gloves; replace clean supplies as required; and wipe up spills on floor and furniture immediately.

(3) During the noon period, air the waiting room and treatment area. Restore order for the afternoon's operations.

(4) At the end of the day, carry out general cleanup measures in order to have the dispensary in readiness for the next day's operation. As each area is cleaned, restock and arrange all equipment in its proper place. Daily cleanup measures include damp dusting all furniture and damp mopping all floors, to include corners and behind doors.

b. Periodic Measures. Although these measures are not necessarily a part of the daily routine, observe them constantly and accomplish the following at periodic intervals: cleaning windows; cleaning and replacing bulbs in ceiling lights; washing walls and woodwork; cleaning radiators and baseboards; caring for floors, such as removing wax, rewaxing, and polishing; and cleaning and rearranging cabinets and storage shelves.

6–8. Patient Receiving and Records Activities

a. General. The dispensary medical specialist works closely with and may perform part of the duties in the receiving and records section of the dispensary. This section usually includes the reception and appointment desk and the records file. Organization of procedures at this station is essential to assure that: (1) all individuals are received in a courteous, friendly, and professional manner; (2) all patients are seen by a doctor with minimum delay; and (3) emergency cases are seen first. Regardless of his reason for coming to the dispensary, each individual who requests to see a doctor must be permitted to do so.

b. Routine Procedure. Routine procedures established for the receiving and records stations should include an SOP for—

(1) Handling records.

(2) Recording examination and treatments.

(3) Obtaining X-ray, laboratory studies, and other diagnostic measures such as consultations.

(4) Making appointments.

(5) Referring patients.

(6) Filing diagnostic reports returned to the dispensary as the referring activity.

(7) Making necessary entries on the daily worksheet, in a ledger, or on machine records cards to facilitate preparation of the monthly Outpatients Report, DA Form 3537.

c. Ethical Aspects.

(1) *Privileged information.* Information given by the patient to the doctor and all medical and health records are privileged information in connection with professional medical care. The individual authorized access to information which is privileged or to information which would cause embarrassment to the patient will not reveal this information to those not officially concerned with the patient's medical treatment.

(2) *Chaperonage of female patients.* When medical examination or procedures are performed on adult or child female patients, a female nurse or attendant must be present. When female personnel are not assigned to the dispensary, it is important to request that the husband, the parent, or a responsible female adult remain in the dispensary waiting room on call as needed as a chaperon. The male medical specialist assisting with patient care must make certain that an appropriate chaperon is present before preparing the patient for examination, before advising the doctor that the patient is ready for examination or treatment, or before performing any procedure himself.

d. Interpersonal Relations. The manner in which an individual is received when he comes to the dispensary desk and the things he observes while in the receiving area or waiting room create a lasting impression. The family member or friend who accompanies the patient is also concerned with the care and attention received. Four factors which foster good interpersonal relations under all circumstances are courtesy, concern for the individual, sympathetic understanding, and helpfulness.

6–9. The Health Record

a. General. The health record is a permanent, locally available file of records prepared for an individual as he receives medical and dental care. Each contact a person has with medical service as a patient during his military career is recorded in his health record. This health record is divided into two sections: (1) the health record jacket (DD Form 722); and (2) the health record dental folder (DD Form 722–1). The main purpose of the health record is to insure that information on the medical and dental care of an individual is immediately accessible to medical or dental service personnel except during active combat. (Paragraph 6–37 gives information on using DD Form 1380 (U.S. Field Medical Card) in forward combat areas.)

(1) When an individual is at his station, his health record is filed and maintained in the dispensary or other medical treatment facility where he receives primary medical care and in the dental clinic furnishing his dental service. Filing the health record must be in accordance with AR 40–403 and AR 340–18–16.

(2) When an individual is hospitalized, his health record is made available to the hospital.

(3) In combat areas, the health record is filed with the personnel records.

(4) When an individual has a change of station, his health record is forwarded with his personnel records.

b. Contents of Health Record Jacket.

(1) Abstract of Service, Health Record.

(2) Chronological Record of Medical Care (SF 600).

(3) Immunization Record (SF 601).

(4) Report of Medical Examination (SF 88).

(5) Report of Medical History (SF 89).

(6) Other documents of medical significance as described in AR 40–403.

c. Chronological Record of Medical Care (SF 600). The Chronological Record of Medical Care is one of the most important forms in the health record. Each event involving medical care in a person's military health history is recorded on it.

(1) This form is the basic outpatient medical record for all military personnel on whom health records are kept. Every appearance of military personnel for outpatient care at a dispensary or other medical treatment facility should be recorded on it. In addition, this form is used to record a person's admission to hospital or quarters, except under combat conditions.

(2) Entries should be made at the time the patient is seen. Ordinarily, entries in the Chronological Record of Medical Care are made by writing in blue or blue-black ink, but they may be typewritten except when penciled entries are authorized for designation of grade and organization. An entry should include a concise description of symptoms, diagnosis, treatment given, and the name of treating organization. Each entry should be dated and signed by the physician or other person who attends the patient or makes the entry.

(3) When a patient is referred for a consultation or a treatment which will be conducted in an area outside the dispensary, the health record containing the currently used SF 600 usually must accompany the patient or be sent by separate messenger to the referral area. A definite method of signing out the record and returning it promptly to the dispensary must be provided for at the local level. In some instances, the patient may be instructed to call at the dispensary and pick up his record before reporting for his special appointment; in other instances, the clinic to which he has been referred obtains the record in advance of the appointment.

d. Outpatient Medical Record; DA Form 3555. This form is used for recording outpatient care given to military dependents, retired military personnel, and others for whom a health record is not kept.

6–10. Outpatient Report (DA Form 3537)

a. The outpatient report is one of four standard reports prescribed by the Department of Defense for use in the Army and other military medical services. AR 40–419 contains instructions for its preparation. It is prepared and submitted monthly by each separate functioning Army medical treatment facility. A dispensary which is not required to prepare the report must usually provide information to its parent facility, and for this purpose, may use a daily worksheet, a ledger, or machine data cards as prescribed by local policy. The outpatient report gives data on medical care furnished to outpatients, such as—

(1) Outpatient visits and treatments.

(2) Various types of physical examinations.

(3) Immunizations.

(4) Certain diagnostic and treatment procedures.

b. Information on the outpatient report is essential in the preparation of budget estimates, in the analysis of personnel requirements and use, and in evaluation of morbidity (sickness) levels receiving medical attention but not hospitalized.

6–11. Sick Call

Sick call (AR 40–2) is a daily assembly of sick and injured military duty personnel, held each day at a designated place and time, to provide routine medical examination and treatment for persons on duty status. Military personnel not reporting for medical treatment at sick call are seen on an appointment basis except that in an emergency they are seen at any time. After examination, patients medically unfit for duty are admitted to a hospital or confined to quarters. Patients not admitted will be given any necessary treatment. When excused from duty for medical reasons which do not indicate a need for hospitalization, military personnel may be authorized to occupy a bed in a dispensary or to remain in quarters.

a. Individual Sick Slip. Each person who comes to the dispensary on sick call should present an Individual Sick Slip (DD Form 689). The sick slip is prepared in the individual's unit orderly room. It is used to inform the unit commander of the status of a man in his command who has reported on sick call. After examination and treatment of the patient, the attending medical officer indicates the disposition of the patient on the sick slip, which is returned to the unit commander. In exceptional cases, the treatment facility initiates the sick slip; *for example,* when an individual reports directly to the treatment facility in an emergency. Although the sick slip is not a part of the health

record, it is an important means of communication in regard to the individual's duty status.

b. Dental Sick Call. Local policy may prescribe use of an Individual Sick Slip in connection with routine requests for dental attention. Provisions are made in each dental clinic to hold dental sick call. A definite period is set aside, and personnel report directly to the dental clinic, not to medical sick call. In a dental emergency, as in a medical emergency, patients are seen at any time. A dental officer of the day is available during other than normal dental clinic hours. After duty hours, personnel usually report to their regular dispensary or clinic, and dispensary personnel call the dental officer of the day.

6-12. Holding Sick Call

NOTE

This is a typical sick call procedure which is subject to modification locally.

a. Military Personnel, Usual Procedure.

(1) On arrival at the dispensary, the individual reports to the dispensary clerk and gives him the Individual Sick Slip. The clerk checks each slip to see that it contains the necessary information (individual's name, service number, grade, and organization).

(2) The clerk takes each patient's health record from the file for use by the attending doctor. The date of the patient's appearance on sick call is entered in the patient's Chronological Record of Medical Care (SF 600).

(3) A medical specialist receives the health record from the clerk; observes the patient; questions him about his complaint or condition; and takes his temperature, pulse, and respiration for entry on the record.

(*a*) The TPR is taken and recorded as part of the routine examination procedure, since the significance of almost any symptom will change if accompanied by an elevated temperature.

(*b*) The specialist should talk to the patient, listen to his complaints, and observe signs and symptoms of distress or discomfort. Signs and symptoms that are readily observable during the initial contact with the patient include—

Skin (observe lips and nailbeds also, when applicable):
- Temperature—hot or cold to the touch
- Color—flushed or pale
- Rash—location
- Wounds—location, condition of dressing if one is in place

Eyes and Eyelids:
- Pupils—enlarged or pinpoint
- Sclera—white, yellow, or red
- Lids—swollen, encrusted, or clear at lid margins

Complaint of Pain:
- Location
- Start of pain—how and when
- Type—sharp or dull, mild or severe, constant or intermittent

State of Consciousness:
- Alert
- Drowsy
- Orientation to surroundings—knows where he is or seems confused

Nausea or Vomiting:
- Time when started
- If vomited, presence or absence of blood
- Time, content, and source of last meal that was eaten

Temperature, Pulse, Respiration:
- Any marked deviation from normal, which is—
  - temperature—98.6° (oral)
  - pulse—60 to 80
  - respiration—14 to 20
- Abnormalities of pulse rate and rhythm
- Difficulty in breathing

General Posture and Gait:
- Sits and stands with or without difficulty
- Walks with or without difficulty

(*c*) Any patient with an obvious rash, an elevated temperature, a complaint of sore throat, or other upper respiratory symptoms that might indicate a communicable disease should not be left in a common waiting room in close proximity with other patients. A segregated waiting area should be provided. The SOP may be that in such cases the doctor sees the patient in the segregated area before requesting him to come to the examining room.

(4) The health record is taken to the doctor, who is informed immediately of any patient who appears to be acutely ill. The doctor calls in the patients one at a time, questions them, examines them, and determines what treatment they are to have.

(5) If the treatment procedure is one that can be carried out in the dispensary, it will be given either by the doctor or, if he so directs, by a designated assistant.

(6) If further diagnostic study is needed and if this can be done while the patient is on a duty status, the doctor directs the clerk to prepare appropriate forms requesting a laboratory, clinic, hospital, or other suitable installation to do this work.

(7) If the doctor wants medicine dispensed to a patient, he writes a prescription and gives it to the patient, directing him to the dispensary pharmacist. If the medicine is not available in the dispensary, the patient may be instructed to take the prescription to a hospital pharmacy or he may have to return to the dispensary after the pharmacist has obtained it.

NOTE

Many medical or dental officers prefer to keep a small stock of frequently prescribed medications in their office cabinets for ready use. The doctor gives these drugs in prelabeled containers to the patient and instructs him in their proper use. Drugs dispensed in this manner are customarily prepared for dispensing by a pharmacist.

(8) The doctor makes his entry on the patient's SF 600 and includes his determination of the patient's duty status: to return to full duty; to return to duty with limitations specified; to be relieved of duty for "sick in quarters" or for hospitalization.

(9) The doctor makes his entry on the Individual Sick Slip, indicating his disposition of the patient. (Local policy may include indicating the time that the patient was dismissed from Sick Call.)

(10) If it is necessary to hospitalize a patient, the doctor will direct the transfer procedure in accordance with local policy. An individual medical record is prepared for the patient transferred to the hospital. In some instances the clerk in the dispensary in which sick call is held prepares this record; in other instances the A and D Branch of the hospital Registrar Division prepares it.

(11) Patients requiring relief from duty but not hospitalization are carried as "sick in quarters." An individual medical record is prepared by the dispensary clerk for each such case.

b. Nonmilitary Personnel Seen on Sick Call. When nonmilitary personnel are seen as sick call patients (that is, on a nonappointment basis), the procedures are usually the same as for military patients except that Individual Sick Slips are not used and a decision concerning duty status is not necessary.

c. Screening Patients on Sick Call. During normal sick call hours, the medical specialist may screen patients according to an SOP prescribed by the attending doctor. The screening procedure is done to designate priorities for examination by the doctor. As part of the screening procedure, the medical officer may permit a qualified nonprofessional assistant to evaluate and treat certain minor injuries and ailments, such as a scratch or minor abrasion, a cold with no cough or temperature elevation, or a slight headache. When this type of screening is permitted, the patient must be permitted to see a medical officer if he so requests.

d. Post Treatment Care on Sick Call. Following prescribed treatment in the dispensary, the patient should not be dismissed until he has received any necessary instructions, medications, and future appointments. The medical specialist can do much to insure a better quality of patient care when he is able to reinforce the doctor's instructions by making sure the patient understands what he must do as a self-care measure. It is essential that he check the doctor's order on SF 600 and also check with the doctor so that all instructions he gives are in accordance with the doctor's instructions to the patient. If the patient on sick call has had medications administered which may produce drowsiness, any loss of coordination, or a delayed reaction, the medical specialist may often find it necessary to—

(1) Detain the patient in the dispensary for a period of observation. The patient should not be seated in the common waiting room during this time unless no other suitable area is available. A cot or recovery bed is often provided adjacent to the treatment room for this purpose.

(2) Provide an escort if there is any question of the patient's ability to return alone to his orderly room or quarters.

6-13. Continuing Treatment in the Dispensary

The doctor may order the patient to return to the dispensary for a series of treatments over a period of days. (It may not be necessary for the patient to see the doctor each time he comes to the dispensary for continuing treatments such as soaks, dressing changes, irrigations, repeated

injections, or other treatment measures for which a written order has been entered on the patient's SF 600). This general procedure should be followed:

a. The patient reports to the dispensary or clinic at the specified hour.

NOTE

The original Individual Sick Slip may be used or the patient may have received DA Form 8-97 (Medical and Dental Appointment) at the time the followup appointment was made in the dispensary.

b. The clerk obtains the patient's health record from the file, enters the date, and gives the record to the medical specialist.

c. The medical specialist is responsible for—

(1) Checking the doctor's order on SF 600 before any treatment is given. The order usually includes—

(*a*) Type of treatment.

(*b*) Number and duration of treatments.

(*c*) Dosage of medication.

(*d*) The time that the doctor desires to see the patient.

(2) Carrying out the treatment order. He notifies the doctor if there is an apparent change in the patient's condition. He must not hesitate to ask the doctor if further explanation is needed. He also must make certain that he understands the order and knows how to carry it out.

(3) Instructing the patient regarding any self-care measures and the time when the patient is to return to the dispensary.

(4) Recording the treatment given on SF 600.

(5) Consulting the doctor immediately if:

(*a*) The treatment produces unsatisfactory results.

(*b*) The patient reacts unfavorably to the treatment.

(*c*) The patient desires to see the doctor.

6-14. Emergency Treatment in the Dispensary—General Instructions

Emergency medical treatment is the early care given to the wounded, injured, or sick by trained medical personnel. Specific measures to be applied at the scene of an accident in any situation where an individual's life is endangered are discussed in chapter 8; only some general procedures governing initial management of a patient brought to a dispensary for emergency care are discussed in this section. In the dispensary situation, a medical specialist will function primarily as the doctor's assistant. If he is the first person to see the patient who has come or been brought to the dispensary for emergency treatment, he must know how to do first things first.

a. Preparation for Emergency Care. The specialist should be prepared to receive emergency patients. He should make certain that:

(1) He maintains proficiency in applying the basic A, B, C, D measures of first aid—

A. Clear the AIRWAY and restore breathing and heartbeat.

B. Stop the BLEEDING by application of digital pressure to compression points or pressure dressing to the wound.

C. Start shock CONTROL measures by maintaining aeration and blood circulation.

D. Apply a wound DRESSING to protect it from further contamination and control bleeding.

These first aid measures are part of emergency medical treatment and the medical specialist is expected to be expert in their application (ch. 8).

(2) Emergency equipment is ready for use, in its proper location, and immediately available —not locked up.

(3) He knows how to operate all emergency apparatus and how to use all items on an emergency tray. In an emergency, there is no time to look up a technique in a procedure manual, to review an instruction booklet, or to review an SOP.

b. Initial Patient Care Measures. The medical specialist should remember the following instructions:

(1) Do not get excited. Do one thing at a time quickly and efficiently.

(2) Take the patient to an examining or treatment area. Assist the patient to lie down with his head level. If he has been carried on a stretcher or litter, do not move him from the stretcher. Unless he is having difficulty in breathing, keep him lying down with head level until the doctor gives other instructions. If he is having breathing difficulty, he may be more comfortable with the head of the stretcher elevated to support him in a semisitting position.

(3) Find out what is wrong. Observe the patient. Ask him if he is in pain and, if so, where he hurts. This brief questioning will help to determine his state of consciousness.

(4) Look for signs of breathing difficulty, bleeding, shock, or poisoning. Treatment of these conditions takes precedence over everything else because they are life-endangering.

(5) Notify the doctor immediately, giving a brief, accurate description of the nature of the emergency and the patient's condition.

(6) Take and record vital signs.

(7) Loosen and remove enough of the patient's clothing to enable the doctor to examine the patient, back and front. Handle the patient gently to avoid injury. If it is necessary to cut his clothing, ask for his permission or for that of an accompanying relative, if possible. Cut clothing along seams, if practicable, so that it can be repaired.

(8) Assist the doctor as needed, obtaining any equipment and carrying out all orders quickly and accurately.

c. Followup Measures.

(1) Assure the patient's relatives or other concerned individuals who have brought the patient to the dispensary that care is being given. Request them to remain in a designated area in the dispensary waiting room until the doctor can see them. Make them as comfortable as possible.

(2) Handle the patient's personal possessions as carefully as possible. Safeguard money, identification papers, and other valuables, following the SOP. If eyeglasses, dentures, a hearing aid, or other prosthetic appliance are removed from the patient's person, handle as if they were valuables.

(3) If other patients are waiting for care, explain briefly why their care is delayed.

(4) Plan to review and discuss the emergency situation with the doctor and other dispensary personnel afterward—how it was handled, what deficiencies were noted, and what must be done to improve the handling of future emergencies.

6–15. Accident Reporting

a. Installation commanders are authorized to make use of a duplicate copy of the sick slip in lieu of DA Form 1051 (AR 385–40) in cases of nonbattle injury of Army active duty military personnel for whom sick slips are ordinarily prepared. The individual initiating the sick slip will check the "Injury" box at the top of the form. Two copies of the form will be initiated for all injury cases, including suspected poisoning cases. After the medical officer's section of the form has been completed, the second copy of the slip will be forwarded to the safety officer concerned by means of a Memo Routing Slip (OF 41).

b. DA Form 1051 (Record of Injury) when used, is initiated in three copies by the supervisor of the individual concerned, and delivered by the patient, if possible, to the dispensary or first aid station. After the medical officer or medical attendant has completed his section of the form, distribution is made as follows: first copy returned to supervisor; second copy retained by medical treatment facility; third copy forwarded to safety officer concerned.

6–16. Resuscitator—Inhalator—Aspirator Apparatus

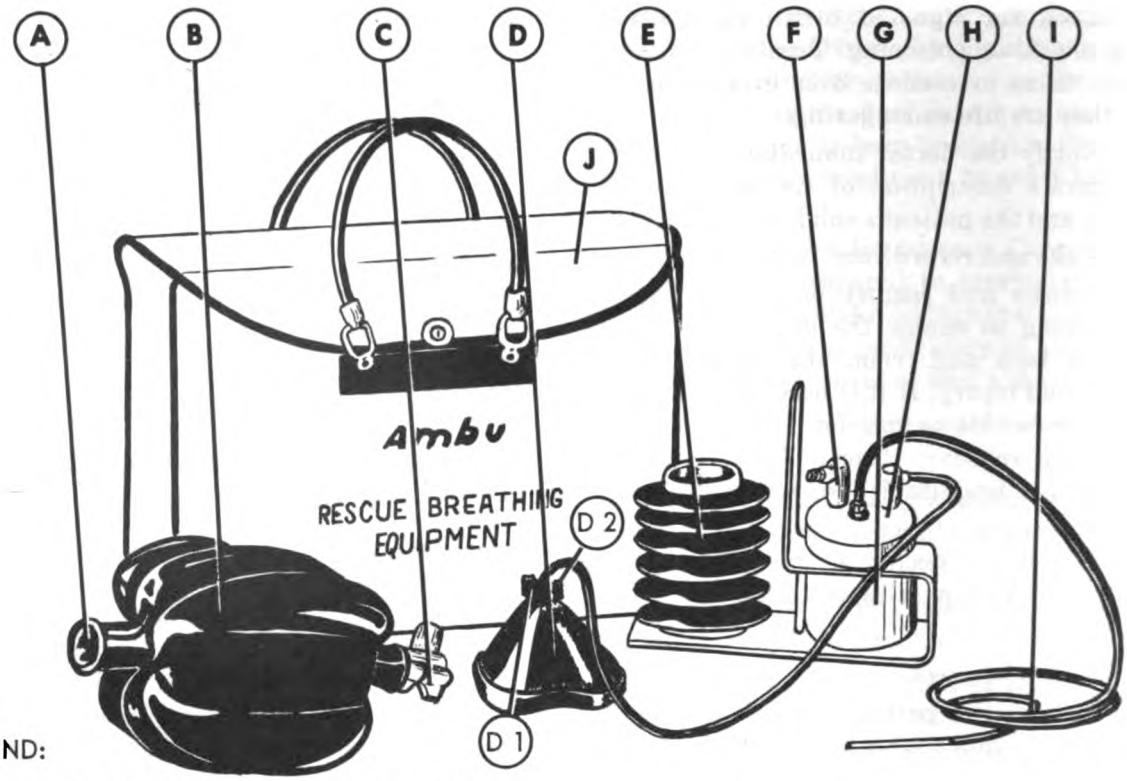
a. General. A resuscitator-inhalator-aspirator apparatus is a multipurpose lifesaving instrument serving as (1) a resuscitator when there is no breathing or when breathing assistance is needed because of difficult, slow, or very shallow respirations; (2) an aspirator (suction apparatus) when the airway must be cleared of mucus, vomitus, or blood; and (3) an inhalator when oxygen is administered. Several kinds of units are available for use in outpatient clinics, ambulances, dispensaries and other areas in which emergency medical care is provided. The different types available as TOE or as stock items for issue on requisition are illustrated: a manual-cycling (hand-pressure-operated) portable unit (fig. 6–1); a pulmotor-type, automatic-cycling portable unit which requires attachment to an oxygen cylinder (fig. 6–2); and a mobile unit similar in appearance to an anesthesia machine (fig. 6–3), which requires attachment to an oxygen cylinder for operation as a resuscitator and inhalator and an electric outlet for its motor-powered aspirator. Regardless of the type of apparatus used, key points to remember are as follows:

(1) Know how to use the available apparatus at a moment's notice.

(2) Inspect, maintain, and test the apparatus at regular, scheduled intervals.

(3) When resuscitation is needed, do not wait for the apparatus. Start mouth-to-mouth respiration and continue this "rescue breathing" until the mechanical apparatus is in readiness for use.

(4) Keep the patient's head tilted backward, his lower jaw forward and raised upward, and his tongue pulled forward to maintain an open airway. The apparatus is useless if air does not reach his lungs. Do not hesitate to use fingers to sweep



LEGEND:

A – INLET VALVE, FOR AIR OR OXYGEN.

B – RESUSCITATOR BAG, FOR HAND COMPRESSION.

C – VALVE ASSEMBLY FOR INHALATION-EXHALATION.

D – ORONASAL MASK. NOTE: FIT MASK VALVE (D 1) ON TO VALVE ASSEMBLY. THE NARROW END OF THE MASK FITS OVER THE NOSE. THE MASK INFLATION VALVE (D 2) IS USED TO INFLATE THE CUSHION RIM OF THE MASK TO INSURE AN AIR-TIGHT FIT OVER THE NOSE AND MOUTH OF INDIVIDUALS WITH DIFFERENT FACIAL DIMENSIONS. NOTE: IF AN INFLATION BULB IS NOT SUPPLIED WITH THE EQUIPMENT, USE THE BULB FROM A SPHYGMOMANOMETER.

E – ASPIRATOR BELLOWS, FOR FOOT-OPERATION OF ASPIRATOR.

F – OVERFLOW VALVE.

G – PLASTIC SECRETIONS BOTTLE.

H – DETACHABLE SEALING CAP FOR ASPIRATOR.

I – ASPIRATOR TUBE ASSEMBLY, FOR OROPHARYNGEAL SUCTIONING.

J – CANVAS CARRYING CASE (BRIGHT YELLOW IN COLOR).

Figure 6–1. Manual-cycling, portable resuscitator-aspirator unit, hand operated.

tongue forward and clear air passage—if patient is not breathing and is unconscious, he cannot bite.

b. General Instructions.

(1) Study the instruction booklet on operating and caring for the unit available. Instructions and diagrams are provided by the manufacturer; in most instances, basic instructions are imprinted on a label mounted on the lid of the carrying case, and a booklet supplementing these instructions is in a holder in the case.

(2) Test the equipment at regular, scheduled intervals. Do not merely open the case and look at the apparatus; put all parts together and operate it.

(3) Never store the apparatus after use until all parts have been cleaned and checked and are known to be workable.

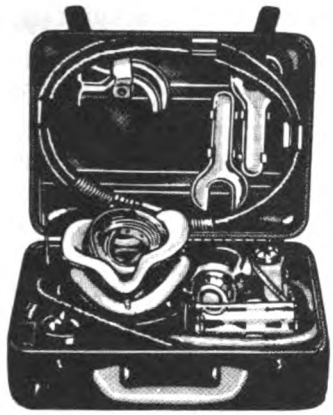


Figure 6–2. Resuscitator-inhalator-aspirator, portable (pulmotor-type, automatic cycling.)

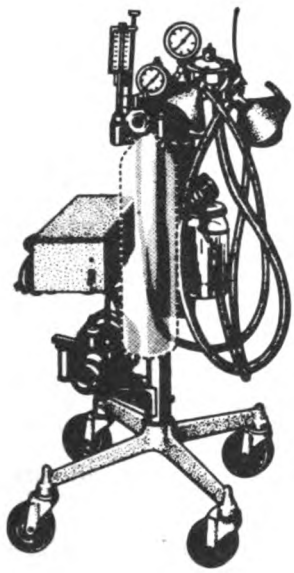


Figure 6–3. Resuscitator-inhalator-aspirator, mobile.

(4) Know how to connect and use the oxygen cylinder provided for emergency use with the portable resuscitator. A small (size D) cylinder is customarily used. With some models, the oxygen cylinder is carried in the lid or base of the resuscitator case; with other models, a cylinder of oxygen must be carried as separate equipment. When the cylinder is not an integral part of the resuscitator unit, a yoke adapter (fig. 6–4) must be used with the size D cylinder; the adapter permits connection of the cylinder with an oxygen regulator for administration of oxygen. Always check to insure that the cylinder actually contains oxygen; never leave an almost empty or empty cylinder adjacent to or attached to the resuscitator. When full, the small (size D) cylinder contains approximately 350 liters of oxygen.

Figure 6–4. Yoke-adapter for connecting oxygen regulator to size D cylinder.

(5) Forbid smoking when oxygen is in use. Bystanders at the scene must be reminded, as habitual smokers tend to light up a cigarette during periods of stress or nervous tension.

(6) Remember, the apparatus and the operator together are the lifesaving team. The operator must know how to use the apparatus and must also watch and listen for patient response to resuscitation.

- Watch for rise and fall of the patient's chest, indicating breathing is taking place. For an adult, a rate of 12 to 14 times per minute is usually advised; for a child, a rate of 20 per minute.
- When the mask is in place, watch for vomiting. Remove the mask immediately and use the aspirator to clear the back of the throat.
- Watch the patient's eyes for movement and response of the pupils to light. In acute anoxia, the pupils are widely dilated; as the lungs become aerated and oxygen is made available to the tissues, the pupils will start to constrict. Raise the eyelids gently to check for pupil response.
- Watch the patient's skin and nailbeds for return of pink color. In acute anoxia, the color is ashy or cyanotic.
- Listen for snoring or gurgling sounds from the patient when the manual operated apparatus is used and for rapidly fluttering or chattering sounds when the automatic cycling apparatus is used. Either type of sound indicates that the patient's airway is blocked and therefore air is not getting into his air passage. Correct the elevation of the patient's chin—tilt his head back until the chin points to the ceiling. If this does not correct the obstruction, remove the mask and suction the airway. Then immediately

reapply the mask, making sure that there is an airtight seal over the nose and mouth.

(7) Be prepared to initiate mouth-to-mouth resuscitation immediately if the mechanical apparatus fails to maintain respiration. Remember, an automatic-cycling model requires an oxygen supply; if the supply is used up before the patient is breathing spontaneously, the apparatus is useless.

(8) When the patient begins to breathe spontaneously, adjust operation of the mechanical apparatus to assist the patient. Do not make him fight the apparatus; he may be dazed or semiconscious and cannot be expected to understand verbal instructions to "breathe with the machine."

(9) Continue rescue breathing efforts, either by means of the apparatus or by mouth-to-mouth resuscitation until a doctor is present and gives other instructions or until the patient is breathing regularly on his own.

(10) When normal respirations have been reestablished, continue oxygen administration by mask (if oxygen is available) if there is any sign of oxygen deficiency.

6–17. Administration of Medications in the Dispensary

a. General. The approved procedures for administering medications are described in chapter 4. Since deviation from an approved technique in pouring or administering a medication increases the possibility of error, any modification or variation of these procedures should be in accordance with a local, written SOP approved by and signed by the dispensary surgeon. Many complex and potent drugs are available for use upon prescription by the dispensary surgeon, and the dispensary specialist is often expected to assume far more individual responsibility for their administration than he normally would assume if assigned to a hospital ward. Most drugs administered in the dispensary are single-dose orders administered to an individual patient on a nonrepetitive basis. These steps should be followed:

(1) Take the patient's health record in which the doctor's order is written on SF 600 to the medication cabinet. Check the drug container label against the written order, reading the label 3 times as required for pouring or preparing medication.

(2) When SF 600 cannot be used, copy the order exactly as written on a slip of paper. Write the patient's name on the slip of paper. Do not rely on memory—use an accurately written notation.

(3) Identify the patient by name before administering the medication.

(4) In recording medications administered in the dispensary, use SF 600. Record time of administration and your signature.

b. Handling and Storing Medications. These steps should be followed:

(1) Handle and store medications in accordance with AR 40–2 and the SOP established by the dispensary surgeon.

(2) Store medications in a special locked cabinet used only for that purpose.

(3) Store narcotics and other controlled drugs (AR 40–2) in a separate locked compartment of the locked medicine cabinet. The responsible officer must account for these drugs. Keep medicine cabinet locked when not in use. Guard medicine cabinet keys and narcotic compartment keys according to the SOP established by the dispensary surgeon.

(4) Store drugs that are required by instructions on the label to be kept refrigerated in a refrigerator provided for this purpose.

NOTE

Drugs, food, and laboratory specimens require separate refrigerator units.

A thermometer must be kept in the refrigerator to insure that prescribed temperature conditions are being met.

(5) Store internal and external medications on separate shelves.

NOTE

In accordance with labeling requirements of the FDCA, some drugs must be clearly labeled "POISON" that under prescribed conditions are administered internally. Drugs for internal use bearing a "POISON" label need not be stored separately from other internal drugs.

(6) Keep medicine cabinet adequately stocked but avoid overstocking.

(7) Keep medicine storage areas clean and orderly.

(8) Rotate medications so that fresh medications are placed to the rear when duplicate containers are on the shelf. Use older stock first.

(9) Return all containers with soiled or illegible labels to the pharmacy. Do not relabel containers.

(10) Do not transfer contents from stock bottles to other storage containers.

(11) Keep list of expiration dates of medications prominently posted. Check list daily and return medications with an outdated label to the pharmacy. Request pharmacy to place new expiration date on outer container and medication bottle when expiration date of a medication has been extended by official supply bulletin (SB) notification.

6-18. Dispensing Medications in an Outpatient Medical Treatment Facility

a. General. The term "dispensing" is defined as that branch of pharmacy which is concerned with the distribution of medications, especially with the filling of prescriptions. As established by AR 611-201, duties of the medical corpsman (MOS 91A) include dispensing simple medications and the duties of the medical specialist (MOS 91B) include dispensing medications for minor injuries and ailments. In practice, the role of the medical specialist in relation to dispensing drugs must be defined in a local policy directive which will establish and limit the duties to be performed in the absence of a pharmacy specialist. For example, duties may be limited to handing a specific drug, prepared by a pharmacist and contained in a properly labeled and pre-filled dispensing container, to an authorized individual, in accordance with a written authorization by the dispensary surgeon. In this example, the medical specialist does not fill a prescription. Dispensing of medications by the medical specialist is usually confined to aid station operation, where a pharmacist is not available and medications are dispensed from a medical chest. The medical specialist follows directives provided by the battalion surgeon for use of medications available. He dispenses only permissible quantities, using the drug dispensing envelopes or other containers provided. Drug dispensing procedures are never, under any circumstances, an indiscriminate handing out of available drugs from the drug supply storage area, medical supply chest, or pharmacy section of the facility.

b. Designation of "Simple Medications." There is no one authoritative list of "simple medications" or "medications for minor injuries or ailments" for ready reference by the medical specialist. Drugs on the following list are examples of what may be considered appropriate for him to dispense, under the conditions established by the local directive, when dispensed in the amounts indicated and prepared for dispensing under the procedural controls established by the local pharmacy officer. All of the drugs listed are standard, noncontrolled, FSC class 6505 items.

(1) Alkaline Aromatic Mouthwash ---------- 120 ml.
(2) Aluminum Hydroxide Gel, Liquid (Amphojel) ---------- 120 ml.
(3) Aluminum Hydroxide Gel, Tablets ---------- 25 tablets
(4) Aspirin Tablets, 0.3 Gm. ---------- 25 tablets
(5) Calamine Lotion, Phenolated and Metholated ---------- 120 ml.
(6) Foot Powder, Fungicidal 1-oz. can ---------- 1 can
(7) Glyceryl Guaiacolate Syrup Plain (Cough Syrup) ---------- 60 ml.
(8) Mineral oil ---------- 120 ml.
(9) Phenylephrine Hydrochloride Solution, 0.25% (NeoSynephrine nosedrops) ---- 15 ml.
(10) Sodium Bicarbonate Tablets, 0.6 Gm. ---------- 25 tablets
(11) Sodium Chloride Tablets, 0.6 Gm. (Salt tablets, uncoated) ---------- 25 tablets
(12) Thimerosal Tincture ---------- 15 ml.
(13) Undecylenic Acid Ointment, 1 oz. tube (Fungicidal Ointment) ---------- 1 tube
(14) Zinc Oxide Ointment, 1-oz. tube ---------- 1 tube

6-19. Nursing Techniques and Procedures in the Dispensary

The more common treatments ordered by the dispensary surgeon and carried out by the dispensary specialist by the direction of and under the supervision of the doctor (or nurse, when one is assigned) include many basic nursing procedures discussed in chapter 5. Unless otherwise specified, no modification in carrying out these procedures is necessary or advisable, whether they are performed in a hospital ward or in a dispensary treatment area. In the dispensary, the treatment room or other designated patient care area is usually the locale for carrying out the procedure instead of at the bedside. When a procedure is to be done with the patient lying down, he is positioned on a treatment table, litter, wheeled

stretcher, or cot, in lieu of the conventional hospital bed. With few exceptions, standard equipment listed and illustrated in the Federal Supply Catalog will be used. This equipment is cared for in the same manner as on a hospital ward. The special points to be emphasized are:

a. In the dispensary, the medical specialist must often carry out procedures with minimum direction from the doctor and often with no direct supervision by a professional nurse. He must therefore make certain that he understands the doctor's order and knows how to carry out the prescribed procedure in a safe and effective manner.

b. When questions or problems arise in relation to nursing activities in an Army Medical Department facility that functions without an assigned nurse, the medical specialist requests, through his medical officer, the nursing consultation services available from Army area headquarters (para 1–21*e*).

6–20. Dispensary Ward Unit

a. General. Personnel, supplies, and equipment, in accordance with the TDA or TOE under which the unit operates, are provided for a dispensary with the requirement for setting up a ward unit. As in the clinic area of the dispensary, the ward unit functions under the direct supervision of the dispensary surgeon. In the absence of a nurse, the surgeon would probably delegate ward management activities to the senior clinical specialist (MOS 91C40), who would then function in a role comparable to that of a head nurse on a hospital ward, as well as serve as wardmaster. In this dual role, the designated individual must be clinically competent in his military occupational specialty and also able to carry out administrative, supervisory, and teaching functions.

b. Ward Management Activities. Dispensary ward management activities should follow the same general pattern as that of a hospital ward, with the necessary adaptations made to fit the needs of the operating unit. Whether the ward has few or many patients, efficient management methods must be employed so that all patients receive the medical and nursing care required, day and night. In conjunction with the dispensary surgeon, the designated wardmaster should select specific administrative procedures and incorporate these concepts into the dispensary ward SOP. Two useful nursing service tools of administration will be—

(1) Preparation of a master list of ward duties. This is based on the determination of all the activities necessary for functioning and maintenance of the ward. All routine, recurrent duties are then grouped as Duty 1, Duty 2, Duty 3, etc., and the consolidated list is posted prominently on a ward personnel bulletin board or in a centrally located SOP notebook.

(2) Use of the Nursing Service Assignment Roster (DA Form 8–246). This form is used to consolidate the assignment of duties on a 24-hour basis for each nursing member of the ward for one week in advance. It shows assignments of patients for nursing care, allocation of ward management tasks by master list grouping, coverage for meal hours, etc.

(3) See chapter 9, section V, for further details about ward administrative activities.

c. Special Considerations.

(1) *Nursing techniques and procedures.* Follow the procedures in chapter 5. For administration of medications, follow the procedures in chapter 4.

(2) *The patient's clinical record.* As in any medical treatment facility, all medical treatment must be recorded as directed by AR 40–400. In a dispensary ward, the clinical record forms which are used and maintained by nursing personnel may vary. For example, the dispensary surgeon may decide that it is practicable to use SF 539 (Abbreviated Clinical Record); or again, DD Form 728 (Doctor's Orders), and DD Form 640 (Nursing Notes), may be used, with these forms filed in a Nursing Book Unit (Kardex). Whatever forms are used, the information entered must be accurate and contain no erasures or eradications.

(3) *Food service for patients.* Food service for patients on the dispensary ward will be provided from the existing field ration mess. Each dispensary unit must establish its own working relations with its designated mess support unit, including arrangements for delivery of meals to the unit and provision of liquid nourishments as prescribed by the medical or dental officer. A major problem in any field-type patient care unit requiring meal service is the prompt and proper care of soiled dishes after every meal, including dishwashing. In a conventional hospital ward, the hospital food service division assumes this responsibility. A dispensary ward, however, is normally not under the jurisdiction of a hospital food service branch. Ward personnel must have a clear

directive on what constitutes ward KP duties. If manual dishwashing must be done, establish an SOP based on AR 40–5. For washing mess gear, follow directives for washing devices as described in FM 21–10.

6–21. Assisting With Physical Examinations

a. General. Physical examinations in dispensaries and physical examining stations are conducted in accordance with AR 40–501. The objectives of military medical (physical) examinations are to provide information:

(1) On the health of the individual.

(2) For initiation of treatment of illness.

(3) For administrative and legal requirements.

b. Planning for Physical Examinations. Examinations are scheduled in advance with the examining facility. When they are conducted in the dispensary instead of in a separate physical examination facility, they are planned for some time other than sick call. This is to help eliminate contact of healthy individuals with sick personnel. The dispensary waiting rooms and examining rooms should be cleaned and aired before being used for physical examinations. The amount of prior planning required to conduct medical examinations efficiently depends upon the number of examinees expected and the number of examining physicians to be assisted. In general, the NCOIC should make the following prior arrangements:

(1) Assign personnel to stations and examination areas.

(2) Provide female personnel to assist the physician with examination of females. Although females are usually referred to a gynecology clinic for the required pelvic examination, other parts of the medical examination require special draping and positioning.

(3) Post signs in the dressing room reminding examinees to carry their valuables with them. The examining facility cannot assume responsibility for lost or missing valuables, and unfortunately losses can and do occur.

(4) When gowns or other drapes are used, provide a clean garment for each examinee and a clearly marked laundry hamper for discards.

(5) Be sure the area to which the examinee is directed for a collection of urine specimen is equipped with handwashing and waste disposal facilities, soap, and towels.

(6) At the conclusion of the examination, be certain that all examinees who require followup consultation appointments or diagnostic study requests remain in the dispensary until they have the necessary appointments, forms, and instructions. Each examinee requiring this followup should be given a DA Form 8–97 (Appointment Form), as a personal reminder.

(7) If the examinee seems puzzled or apprehensive about the results of the examination, refer him back to the examining physician for additional information.

c. Responsibilities of Dispensary Enlisted Personnel. When required or indicated by the examining physician, enlisted medical personnel or civilian employees properly qualified by training and experience may conduct the following phase of the medical examination and record results when appropriate, subject to verification of abnormal results by the physician:

(1) Height and weight.

(2) Blood pressure and pulse rate.

(3) Temperature.

(4) Electrocardiogram.

(5) Venipuncture for serology.

(6) Performance of laboratory procedures on specimens submitted.*

(7) X-rays.*

(8) Visual acuity.*

(9) Color vision.*

(10) Determination of prescription of glasses by lensometer.*

(11) Auditory acuity (audiometry).*

* These procedures normally are not performed by the medical or clinical specialist.

d. Forms Required. Standard forms are used for the medical examination.

(1) Administrative data in the heading of Standard Form 88 (Report of Medical Examination) is entered in advance by clerical personnel. All other entries are made by the physician or, when so indicated by the physician, by the enlisted assistant.

(2) Standard Form 89 (Report of Medical History) is prepared by the examinee before being examined. It provides the examining physician with an indication of a need for special discussion with the examinee. Trained enlisted personnel and qualified civilians may instruct and assist examinees in the preparation of this report but these assistants make no entries other than

information required for date of examination and examining facility. The examinee should be told that his entries and comments are confidential, for use only by the physician. The examinee signs SF 89.

(3) Both SF 88 and SF 89 are filed in the individual examinee's health record.

e. Conduct Required of Medical Specialist When Assisting With Medical Examinations.

(1) Be courteous and considerate of the examinee.

(2) Be alert and ready to assist the physician and the examinee whenever needed.

(3) Anticipate and prepare to meet the physician's and the examinee's needs during the course of an examination.

(4) Perform routine procedures with a minimum of supervision. Such procedures include keeping examining rooms cleaned, restocked, and cleared of contaminated articles.

(5) Keep unnecessary noise and activity to a minimum.

Section III. IMMUNIZATIONS

6–22. General

a. Immunity. Immunity, the individual's resistance to a specific disease or infection, depends upon the presence in the body of protective chemical substances called antibodies. When the body produces its own antibodies, it is termed active immunity. Active immunity results from having an infectious disease or from receiving an injection or inoculation of biological medication which stimulates the formation of antibodies but does not produce the disease. Active immunity may develop in days or weeks, but the protection received will last for relatively long periods of time. Another type of immunity, described as passive, results from the body receiving serum containing antibodies which have already been produced in the body of a horse, rabbit, some other animal, or a human. Although this serum confers immediate protection, the immunity does not last as long. Passive immunity does not stimulate antibody formation.

b. Immunizing Agents. Preparations administered to produce immunity are called immunizing agents. They are known as vaccines, toxoids, and antisera. Both vaccines and toxoids cause the body to produce their own antibodies, bringing about active immunity, while antisera produce passive immunity.

(1) *Vaccines.* These immunizing agents are suspensions of killed, or live but attenuated (altered), bacteria, rickettsia, or viruses. Examples are typhoid-paratyphoid, typhus, measles, poliomyelitis, and smallpox vaccines.

(2) *Toxoids.* These immunizing agents are suspensions of modified toxins, the poisonous products of certain pathogenic organisms. Examples are diphtheria and tetanus toxoid.

(3) *Antisera.* These immunizing agents are preparations of blood serum which already contain antibodies. They are used in emergencies when it is essential to provide protection but there is not time to wait for the body of the exposed or infected person to produce its own antibodies. Examples are tetanus antitoxin, antirabies serum, and immune globulin.

6–23. The Army Immunization Program

a. Immunization Required. The Army requires all its military personnel to be actively immunized against smallpox, typhoid-paratyphoid, tetanus, diphtheria, poliomyelitis, influenza, typhus, and yellow fever. Individuals who will travel to certain areas are also required to be immunized against cholera and perhaps plague. Upon initial induction, recruits are also given adenovirus vaccine. AR 40–562 gives details of requirements, dosage, and administration. Additional information on immunizations and immunizing agents may be found in TB MED 114. Copies of these two publications governing the administration of immunization to members of the Armed Forces and their dependents must be kept readily available at all locations where immunizing agents are administered. Every medical specialist who gives immunizations must read and be familiar with the contents of these directives.

b. Intervals. The intervals prescribed in AR 40–562 are optimum and should be adhered to as closely as possible, but they are minimum intervals and must never be shortened. If a series is interrupted before completion, it should not be started again but should be completed by giving the remaining injections, regardless of time lapse. If a period longer than that prescribed between stimulating (booster) doses has elapsed, the ini-

tial series is not repeated. Once a basic series is completed, it need never be repeated—a stimulating does is adequate; the single small booster dose renews the production of antibodies to an effective immunizing level.

c. Immunization Record (SF 601). This form is prepared (in original only) for all military personnel when the initial series of immunizations are given. All immunizations will be recorded on this form which is kept in the health record. It is not only the official record of an individual's immunizations and related data, but is also the source of information for completing the Immunization Certificate.

d. Immunization Certificate. A Public Health Service Certificate (PHS Form 731) (International Certificate of Vaccination) is now used in lieu of the formerly issued DD Form 737, Immunization Certificate. The PHS Form 731 is prepared for but carried by active duty military personnel only when performing international travel. Nonmilitary personnel retain PHS Form 731 as their official record of immunizations received.

NOTE

Entries for smallpox, cholera, and yellow fever must be authenticated on PHS Form 731 by the Department of Defense immunization stamp and the actual signature of the medical officer. Immunizations other than smallpox, cholera, and yellow fever may be authenticated by initialing.

e. Reponsibilities of the Medical Specialist. As a member of the Armed Forces, a medical specialist is obligated to inform himself concerning the Army Immunization Program (AR 40–562 and TB MED 114). As a member of the medical team the medical specialist will assist others to understand and appreciate the necessity of these immunizations by explaining the program to other soldiers and to their families and dependents. If he works in a dispensary, he will usually be responsible for assisting with and carrying out proper immunization techniques.

6–24. General Rules and Safety Precautions

a. Follow the standing operation procedure of the installation and AR 40–562.

(1) A physician should be physically present or at a specified location known to the vaccinator whenever injections are given.

(2) Always ask the patient and check his Immunization Record or Immunization Certificate for any history of allergic reactions. History of reactions to previous immunization is of great importance; that of allergy to eggs or fowl is important when immunizing agents prepared in eggs are used (influenza, typhus, yellow fever). All allergic patients, as well as those presenting a doubtful history, should be referred to a medical officer for decision as to immunizing procedure.

(3) In case of allergic reaction to the immunizing agent, the following should be ready for immediate use:

- Epinephrine (adrenalin) 1:1000, sterile syringe, sterile needle, and tourniquet. The epinephrine should be in the syringe ready for immediate injection.

NOTE

It is recommended that the standard cartridge-needle unit be used.

- Pulmonary resuscitation unit.

(4) Follow local policy for questioning women as to whether they are pregnant. Be tactful and discreet when asking this question to avoid unnecessary embarrassment in a public place. This information is important because of the possible effect of certain immunizing agents on the unborn child.

b. Use an individually autoclaved syringe and needle (or sterile disposable) for each injection. Agents should never be combined in one syringe to avoid giving more than one injection to the same individual. Follow local directives for administering more than one immunizing agent at the same time to one individual.

c. Use sterile technique when preparing and giving the injection.

d. Instruct all patients to remain in a designated area of the dispensary or clinic where they may be observed for a possible reaction for 30 minutes after immunization.

6–25. Risks and Reactions

a. Risks. Injection of any substance into the human body is never without some risk; the risk, however, can be reduced to a minimum by following instructions and using sterile techniques when preparing and administering immunizing agents.

b. Types of Reaction.

(1) *Allergic.* Allergic reactions vary in nature, severity, and time of onset. Reactions may

occur immediately and be characterized by collapse of the circulatory system and respiratory difficulty (anaphylactic shock); this reaction must be treated without delay as death can occur. Less severe but serious reactions which occur 20 minutes or so after inoculation may first be noted by the occurrence of urticaria (hives) and pruritis (itching), particularly when the nose itches and sneezing follows.

(2) *General.* Some vaccines after a period of from several hours to a day or two may produce general systemic reactions consisting of fever, malaise (general aches and pains), chills, and gastrointestinal upset, as well as a local reaction of swelling, redness, and tenderness at the site of injection.

(3) *Infection.* An improper technique or use of contaminated agents may result in either a local infection (abscess at site of injection) or a general systemic infection such as infectious hepatitis.

6–26. Immediate First Aid Measures in Anaphylactic Reactions

If an anaphylactic reaction occurs, the medical specialist should—

a. Immediately give 0.5 ml. epinephrine 1:1000 subcutaneously in any available area without stopping to prepare the injection site.

b. If the vaccine or serum injection was given in an arm, put a tight tourniquet proximal (toward the heart) to the site of the injection to delay further absorption of the vaccine.

c. Obtain a physician as soon as possible.

d. Be prepared to assist with venipuncture and other measures which may be required, such as—

(1) Artificial respiration (mouth-to-mouth or mechanical resuscitator).

(2) Intravenous drug administration to maintain blood pressure if the patient is in shock.

(3) General supportive measures such as oxygen inhalation by mask, pharyngeal suction to maintain or open airway, and warmth.

e. Be prepared to provide constant attendance for the first 24 hours after severe reactions. Secondary lapses into shock may occur at any time. The individual is usually admitted to a hospital or dispensary ward unit for observation.

6–27. Storage of Vaccine

The proper storage temperature of different vaccines is always found on the label and must be adhered to.

a. Some vaccines that contain live organisms must remain frozen. Since a considerable amount of variation exists between storage temperatures and potency periods for these vaccines in both the preconstituted and reconstituted forms of the vaccines, it is essential to review instructions on the labels for each vaccine.

b. Other immunizing agents should be kept at ordinary refrigeration temperature; they are relatively stable and do not lose their potency if kept at ordinary outdoor or room temperature (33° to 93° degrees F) for periods up to one week.

WARNING

Freezing these agents should be avoided as it may result in damage.

c. The labels of all immunizing agents also indicate an expiration date, the last date that the vaccine can be used. Vaccines or other immunizing agents must not be used after that date.

6–28. Immunizing Methods

At the present time, polio vaccines are the only Army-used immunizing agents given orally. Smallpox vaccine is the only one given by multiple-pressure technique, a form of intradermal inoculation of the immunizing agent. Under certain conditions at the direction of a medical officer, some immunizing agents can be given by intradermal injections but the usual methods are intramuscular (IM) or subcutaneous (SC) injection. The procedure for injection techniques by syringe and needle is given in paragraphs 4–26 through 4–30. The procedure for giving poliomyelitis vaccine, oral, is prescribed in AR 40–562.

6–29. Multiple-Pressure Technique in Smallpox Vaccination

a. Smallpox Vaccine. This vaccine contains live vaccinia virus. The approved vaccine is lyophilized (freeze-dried) vaccine which is supplied with a reconstituting fluid and special sterilized needles. Directions for reconstituting the vaccine and assembling the vaccine dispenser are found on the vaccine package.

b. Essentials of a Successful Smallpox Vaccination. Successful smallpox vaccination requires potent vaccine. This can be assured only if it has been stored and handled as prescribed on the package. Proper procedure must also be followed

in preparation of the vaccination site, care of the site after vaccination, reading and recording the reaction, and revaccinating those with unsuccessful vaccination reactions.

c. Multiple-Pressure Vaccination Technique.

(1) Instruct the patient to remove his shirt or other garment from the selected arm. The deltoid region is the site of choice, and no part of the garment should be in contact with this area.

(2) Check the skin area. If grossly dirty, clean the vaccination site with soap and water and dry thoroughly. If there is any evidence of a rash, open lesion, pimples, or other skin disorder, refer the individual to the medical officer for his decision on whether to proceed with the smallpox vaccination.

(3) Wash your hands.

(4) Check assembled equipment—

(*a*) Jar of cotton balls.

(*b*) Acetone or ether.

(c) Needle, double pronged or bifurcated (special-packed).

(*d*) Reconstituted smallpox vaccine in dispenser.

(*e*) Waste container (preferably plastic lined or double-thickness paper bag).

(5) Cleanse injection site with acetone or ether on cotton ball. Allow to dry thoroughly.

NOTE

Alcohol must not be used as it inactivates the vaccine.

(6) Grasp the underside of the patient's arm and hold skin taut.

(7) Express one drop of the reconstituted vaccine directly from the tip of the assembled vaccine dispenser onto the prepared site.

(8) Hold needle parallel to the skin.

(9) Press rapidly through the drop of vaccine with the tip of the needle. The motion should be perpendicular to the skin, and the needle should be lifted clear of the skin with each stroke. When an initial vaccination is given, apply pressure in this manner 5 times in 5 seconds. All subsequent revaccination require 15 pressure strokes.

NOTE

When using a single-pronged needle, double the number of pressure strokes used. Limit total area of vaccination to an area no greater than 1/8 inch in diameter. A properly performed vaccination should not be so deep as to result in bleeding.

(10) Do not blot excess vaccine unless specifically instructed by the medical officer. If blotting is recommended, use dry sterile gauze. The patient may put on his shirt when the area is dry.

(11) Do not apply a dressing.

(12) Instruct patient not to rub or scratch the vaccination at any time.

(13) Wash your hands.

d. Disposal of Equipment Used in Smallpox Inoculation. Special precautions must be taken to prevent inadvertent parenteral injection (accidental vaccination) by careless handling of waste. Consider all used equipment as infectious.

(1) Discard all waste (dispenser assembly; needle; gauze, if used for vaccine blotting) directly into special waste container.

(2) Place waste container directly into a collecting bag for incineration. Do not touch outer surface of collecting bag with any part of waste container or your unwashed hands.

(3) Wash your hands. With clean hands, secure opening of collecting bag and place it in waste disposal container.

e. Interpretation of Vaccination Responses. The smallpox vaccination site should be inspected by the medical officer (or his designated assistant) 6 to 8 days after vaccination. The "reading" is recorded on: (1) the Immunization Record (SF 601) of military personnel or (2) the Immunization Certificate of nonmilitary personnel and military personnel who require possession of this form for international travel. A successful reaction either on primary vaccination or revaccination should occur if a potent vaccine is properly administered. An unsuccessful vaccination must be rescheduled at the time interval specified by the medical officer who has interpreted the reaction. Individuals receiving smallpox vaccine for the first time may be alarmed by the sequence of events which follow a successful primary vaccination. The medical specialist should be aware of what to expect in order to reassure patients. The typical picture is as follows:

4th day after vaccination—a solid, small, elevated lesion (a papule)

5th to 6th day—a typical blister with a depression in its center (umbilicated vesicle)

10th day—pustule or ulceration surrounded by swollen, red skin (indurated skin area)

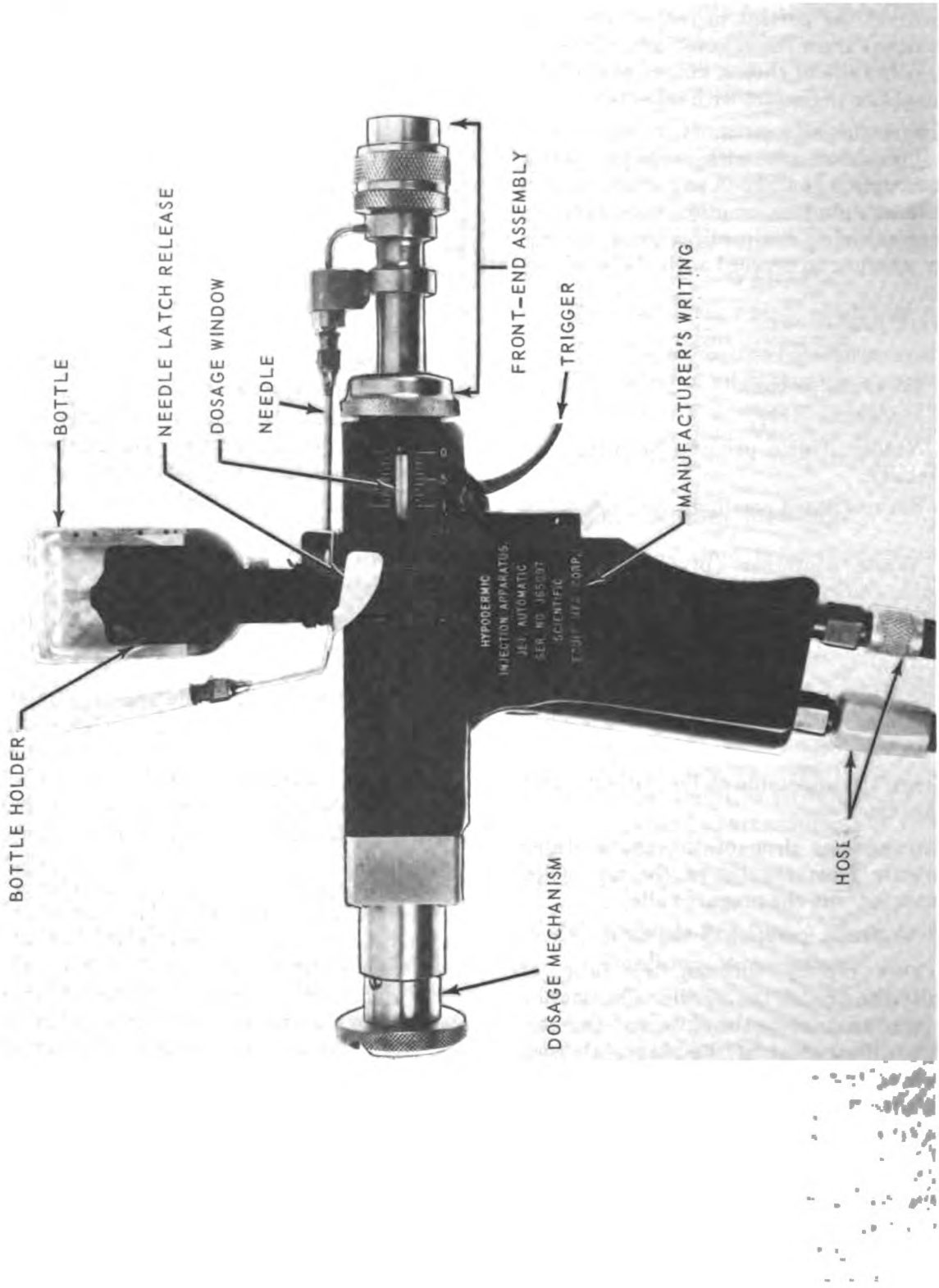


Figure 6–5. Jet hypodermic injection apparatus, automatic.

1. USE YOUR FREE HAND TO SUPPORT PATIENT'S ARM.

2. SELECT A PLACE ON THE PATIENT'S UPPER ARM AS THE SITE FOR THE INJECTION.

3. USE YOUR FINGERS TO PULL THE FLESH TIGHT.

4. PLACE NOZZLE AGAINST ARM SO THAT INJECTOR AND FLESH FORM A 90° ANGLE.

RIGHT ANGLE

WRONG ANGLE

Figure 6–6. Injection technique with jet hypodermic apparatus, automatic.

5. APPLY ENOUGH PRESSURE FOR NOZZLE TO BE PARTLY AND **EVENLY** BURIED IN FLESH.

RIGHT

WRONG

6. HOLD PATIENT AS STILL AS POSSIBLE AND HOLD THE INJECTOR **PERFECTLY STILL** AGAINST THE SITE; REST FINGER ON TRIGGER; THEN PULL TRIGGER WHILE COUNTING--"1001, 1002, 1003." KEEP INJECTOR STILL UNTIL FULL COUNT IS COMPLETED.

WARNING

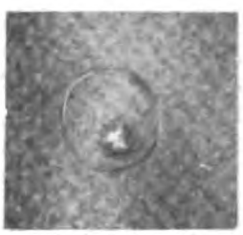
INCOMPLETE INJECTIONS OR EXCESSIVE BLEEDING WILL RESULT IF INJECTOR IS NOT HELD AGAINST THE SITE LONG ENOUGH.

7. **WIPE** THE INJECTION SITE WITH ANY CLEAN MATERIAL (COTTON, GAUZE, ETC.) TO REMOVE EXCESS VACCINE, OR PATIENT MAY GET VACCINE ON HANDS AND IN EYES.

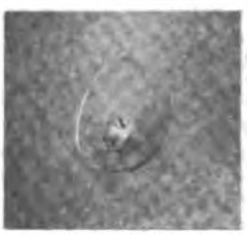
PUT THIS MATERIAL INTO A CONTAINER THAT YOU CAN CLOSE. (YOU CAN DISPOSE OF THIS MATERIAL AT THE END OF THE DAY.)

8. **LOOK** AT THE VACCINATION AND BE SURE IT IS COMPLETE. COMPARE IT WITH THOSE SHOWN BELOW--NOTE NOZZLE PRINT AROUND WHEALS IN THE PICTURES.

EXCELLENT



ACCEPTABLE



INCOMPLETE AND UNACCEPTABLE

IF YOU GET FOUR CONSECUTIVE WHEALS LIKE THIS, YOUR PED-O-JET IS OUT OF ORDER.

Figure 6-6.—Continued.

14th day—scab formation; on subsequent days, there will be gradual separation and dropping off of the scab, leaving a scar.

If an individual has an unusually severe reaction, the specialist should refer him to the medical officer.

6–30. Jet Hypodermic Injection Apparatus, Automatic

The jet hypodermic injection apparatus, automatic (fig. 6–5), commonly referred to as the injection gun, is a standard item designed for immunization procedures. It is commonly used by immunization teams operating under field conditions. When used by a properly trained, skilled operator, the injection gun facilitates mass immunization procedures and reduces the potential hazards of transmitting serum hepatitis by needle and syringe immunization methods. Its use also reduces the requirement for an immunization team to have large numbers of properly sterilized needles and syringes available and eliminates many hours expended in the care and processing of reusable syringes and needles and preparing individual dosage from vaccine vials. The advantages justify the expense of the jet injection equipment and also justify the time and effort that must be expended in training operators in the proper use and maintenance of the jet apparatus. This complex precision device is "automatic" only in the sense that, when properly maintained and assembled, a touch on the trigger will jet-propel a metered quantity of vaccine from the nozzle. When proper technique is used in positioning the nozzle at the injection site, the jet-propelled vaccine is driven through the skin. Interchangeable nozzles, supplied by the manufacturer, are attached by the operator to the gun assembly; one nozzle design permits administration of vaccine intradermally and another nozzle is used for subcutaneous injection. Improper maintenance and assembly will damage the device, cause faulty operation, and result in contamination of the vaccine. Improper injection technique will injure the recipient's skin and will fail to deliver the required dosage of vaccine. Prerequisites for learning the use of the jet injection apparatus include—

a. Having the actual apparatus available while receiving detailed, individualized instruction on maintenance, assembly, operation, and cleaning.

b. Reading all of the instructions and studying the illustrations in the technical manual provided by the manufacturer of the model used.

c. Practicing assembly and operation under supervision before attempting to use the device on a patient.

d. Practicing injection technique recommended by the immunization team director. An accepted technique is illustrated in figure 6–6.

e. Recognizing that any of the following are indications of faulty maintenance, faulty operation, or faulty injection technique:

(1) Off-center or irregular wheals at site of injection.

(2) Lacerations or bleeding at the site of injection.

(3) Incomplete shots as evidenced by large drops of vaccine remaining on the skin surface.

Section V. MINOR SURGERY

6–31. Assisting With Minor Operative Procedures

a. General. A minor operative procedure usually involves an incision but does not necessitate exposure of viscera or large areas of internal body tissue; it is usually a procedure of short duration that is often performed with administration of a local rather than a general anesthetic. When the patient's needs before, during, and after the operative procedure can be met on an outpatient basis, the minor operative procedure may be performed in an appropriately staffed and equipped dispensary. The medical officer who examines the patient and evaluates his condition makes the decision; if the patient's needs cannot be met, he is referred to a hospital for treatment as an inpatient. Examples of minor operative procedures customarily performed in a dispensary or outpatient surgical clinic or emergency room include primary closure of selected superficial incised or lacerated wounds; removal of superficial foreign bodies or small superficial tumors; and incision and drainage (I and D) of an abscess such as a furuncle or paronychia (abscess underlying a nailbed or nail margin). Surgical techniques involved include wound preparation for debridement, suturing, incision, excision, and drainage procedures.

b. Role of the Medical Specialist. The medical specialist is expected to function as the medical officer's nonsterile assistant—as a circulator. (There will be occasions, however, when the surgeon will require a sterile (scrubbed) assistant as well as a circulator; *for example,* to assist with wound preparation for debridement.) The circulator will be directly involved with organization and coordination of activities associated with preoperative patient care, preparation and arrangement of supplies and equipment, assisting the surgeon in a nonsterile (unscrubbed) capacity, and assisting with immediate postoperative patient care. His primary responsibilities are the maintenance of asepsis, anticipation of the surgeon's needs, and safety and comfort of the patient. A basic rule for the circulator is: do not leave the room once the operative procedure has started unless sent out by the surgeon, as he depends upon the circulator's presence to make it possible for him to maintain sterile techniques and to concentrate on the patient and the operative procedure.

c. Routine Duties. In general, routine duties should be organized in a sequence that avoids undue delay and omission of important details. The following outline can serve as a general guide, subject to variations applicable to the local situation. The outline is an adaptation of basic routines discussed in greater detail in TM 8–220. In the dispensary situation, the surgical team is usually composed of only two members—the surgeon, who scrubs and is the sterile member of the team and is both surgeon and anesthetist, and the medical specialist, who as circulator is the nonsterile surgical assistant and room activity coordinator.

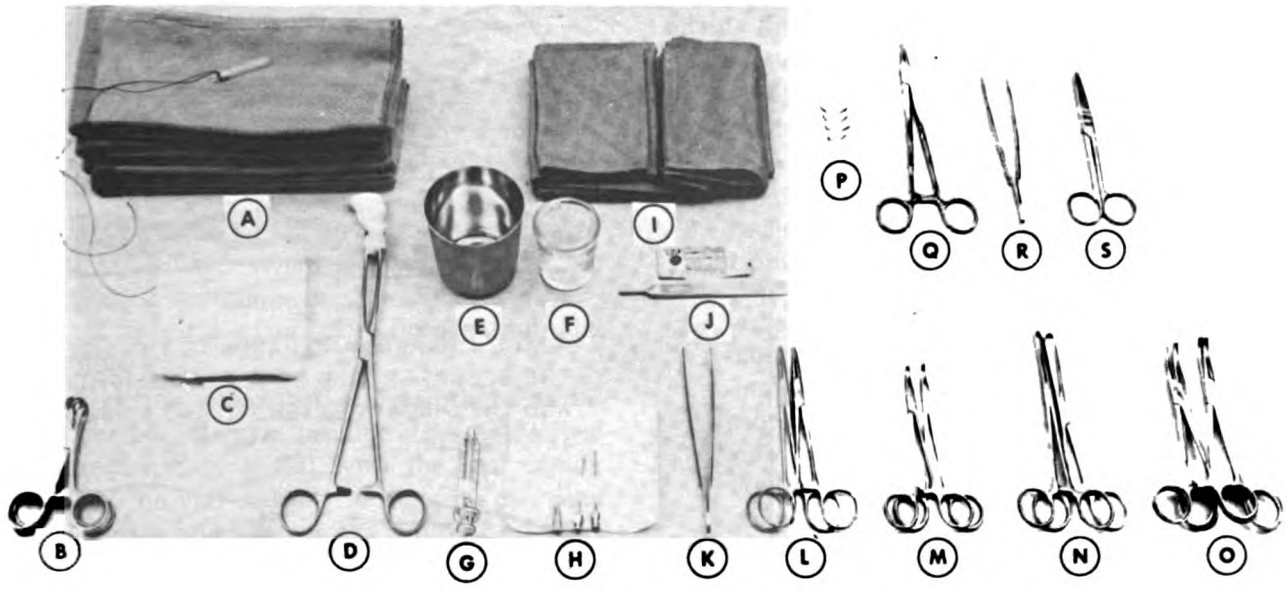
PRELIMINARY DUTIES

1. Check with the surgeon for instructions concerning patient preparation and supplies and equipment required. A locally prepared SOP may be followed, subject to change to meet individual patient needs. Find out if an operative permit, when required, has been signed and included in the Health Record.
2. Tell the patient what is to be done and what he can do to help. Remember, even though he may be outwardly calm and apparently unconcerned, he needs reassurance and support. When possible, escort him to a waiting area apart from other waiting patients but put him where he can be observed.
3. Administer, or verify the administration by another individual, of any prescribed medication. When preoperative sedative, analgesic, or antibiotic drug is ordered, adequate time must elapse for the desired systemic effect; delay in administration will cause undue delay in the start of the scheduled procedure. A booster dose of tetanus toxoid may be prescribed in case of traumatic injury. When required, the surgeon may indicate that it is to precede or follow operative care.
4. Make certain the operating room and its contents are free of dust and of any accumulated waste or debris from previous use. In addition to routine daily cleaning, interim cleaning of floor and equipment may be necessary.

CAUTION

Never dry dust or sweep. When cleaning the floor, use a clean mop head and fresh germicide solution; when dusting equipment and fixtures, use a clean cloth dampened with alcohol, 70 percent.

5. Wash hands. Put on cap and mask.
6. Make certain that equipment normally available for emergency use is accessible and in operating order before the start of any operative procedure. Such equipment includes resuscitator apparatus, oxygen supply, suction apparatus, emergency drug tray, lights (standard and auxiliary battery-powered equipment), and signal light or buzzer for summoning help.
7. Assemble presterilized packs and trays and other supplies and equipment required for the procedure. These materials will usually include the following:
   a. Minor surgery tray (fig. 6–7).
   b. Local anesthetic agent, as prescribed.
   c. Skin antiseptic, as prescribed.
   d. Sterile glove pack.
   e. Sterile brush pack.
   f. Sterile towel pack.
   g. Specimen container for tissue or drainage specimen p.r.n.
   h. Cap and mask (for surgeon).
8. Arrange furniture and equipment for accessibility and convenience in use, taking into consideration the position the surgeon will assume in relation to the patient (right, left, head, or foot of operating table). Place such things as portable instrument stand, stool, waste bucket, suction, and floorlamp accordingly.



USES: TO REPAIR A SURGICAL LACERATION; TO OBTAIN A SPECIMEN OF MUSCLE TISSUE FOR DIAGNOSTIC PURPOSES; TO INCISE A LESION TO PERMIT DRAINAGE

(A) FOUR TOWELS
(B) FOUR TOWEL CLIPS
(C) SPONGES
(D) SPONGE FORCEPS WITH SPONGE
(E) SOLUTION CUP
(F) MEDICINE GLASS
(G) SYRINGE, 2 CC. (ML)
(H) NEEDLES: 25 G., 5/8-INCH; 22 G., 1 1/2-INCH; 18 G., 1 1/2-INCH
(I) DRAPE SHEET
(J) KNIFE HANDLE NO 3 WITH NO 15 BLADE
(K) TISSUE FORCEPS
(L) TWO STRAIGHT MOSQUITO FORCEPS
(M) TWO CURVED MOSQUITO FORCEPS
(N) TWO ALLIS FORCEPS
(O) FOUR CURVED HEMOSTATS, SMALL
(P) SUTURE NEEDLES
(Q) NEEDLE HOLDER
(R) DRESSING FORCEPS
(S) SUTURE SCISSORS

TRAY SIZE: 15 1/2 BY 9 1/2 BY 2 INCHES

WRAPPER SIZE: 36 BY 36 INCHES

STERILIZATION INDICATOR

NOTE: A PACKET OF STERILE BLACK SILK OR NYLON SUTURE MUST ACCOMPANY THE TRAY. WHEN THE TRAY IS TO BE USED FOR OBTAINING A SPECIMEN, A CULTURE TUBE AND A SPECIMEN JAR MUST ALSO ACCOMPANY THE TRAY.

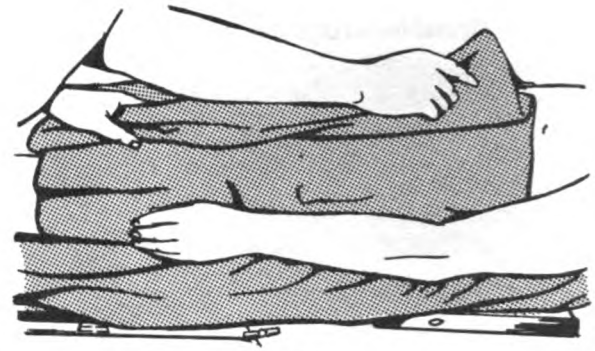
Figure 6–7. Minor surgery tray.

9. Place unopened sterile packs and trays in readiness for use, to be opened just before start of the procedure. Handle all sterile equipment in accordance with basic rules discussed in paragraph 5–47, this manual.
10. When all is in readiness, notify the surgeon. Take Health Record to OR.
11. Escort the patient into the room and assist him onto the table.

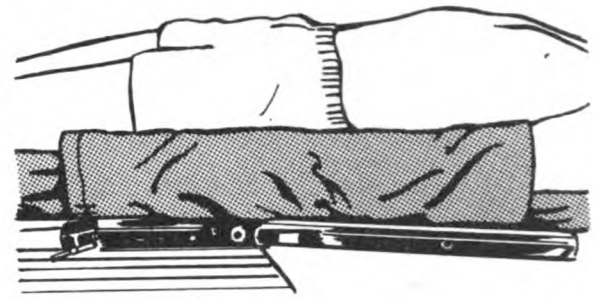
NOTE

Except in an acute emergency, preliminary treatment and physical examination of the patient will have been completed outside the OR area. Check record to insure that all preoperative orders have been carried out. If vital signs have not been recorded, take and record pulse, respiration, and blood pressure. If any unusual signs or symptoms are observed, notify the surgeon so that he can examine the patient and evaluate the condition before he starts to scrub.

12. Position the patient on the table in accordance with instructions, maintaining good body alinement and protecting the patient from contact with any unpadded table surface. The position is usually dorsal recumbent, with the knees directly over the hinged-table break. Expose the affected area. If an arm board is required, place a well-padded, 12-inch wide, arm support level with the table, and position the patient's arm and hand on the padded surface. Restrain the unaffected arm by securing it in the lift sheet (fig. 6–8). Securing the arms in this fashion helps the patient to control inadvertent movements that would interfere with the surgeon's procedure. A thigh strap for support and restraint should be used if that portion of the body is uninvolved in the procedure. Whenever the patient has received a preoperative sedative medication, restraint is mandatory. If an arm board is not required, place both arms in extension at sides and secure both in the lift sheet. A very large patient may require arm boards on both sides of the table for arm supports if the table is too narrow to support the patient's arms and body.
13. Cover the uninvolved body area with a clean sheet.
14. Wash hands.
15. Open outer wrappers of sterile brush, towel, and glove packs. Open outer wrapper of sterile instrument tray, leaving interior wrapper and contents untouched. Once he is scrubbed and gloved, the surgeon handles the sterile surface of the wrapper and the tray contents.



STEP 1.
PLACE THE ARMS AND HANDS AT THE SIDES. THE ELBOWS SHOULD BE FLEXED SLIGHTLY AND THE FINGERS EXTENDED AND SLIGHTLY SEPARATED.



STEP 2.
SECURE THE ARMS AND HANDS WITH THE LEFT SHEET, ANCHORING THE SHEET UNDER THE TABLE PAD.

Figure 6–8. Dorsal recumbent position with arms secured in OR table lift sheet.

DUTIES DURING OPERATIVE PROCEDURE

1. Move the instrument table p.r.n., handling it by grasping underneath and reaching below and outside the limits of the sterile field.
2. Adjust ceiling and floor lights p.r.n., focusing the light so that shadow-free illumination is concentrated on the operative area.
3. Pour solutions as required for final skin and wound preparation. This preparation is always done by the surgeon (or his scrubbed assistant). Replenish sponge supplies p.r.n., using transfer forceps. Hold and support the patient as directed while the prep is done, using utmost care to avoid contact with the surgeon's gloved hand.

4. Assist as directed with draping. Draping for minor procedures is minimal and is usually accomplished with the four towels, four towel clips, and one small fenestrated (windowed) sheet on the presterilized tray. In assisting with draping, avoid all contact with the surgeon's gloves, the sterile surface of the drape, and the cleansed skin area.
5. Assist as directed with administration of local anesthetic. When the surgeon uses an infiltration technique with syringe and needle, it is done after skin preparation and draping.
   a. Check the vital label. Unless otherwise instructed, always provide the prescribed anesthetic in a vial with the seal intact. Hold the vial so that the surgeon can read the label and observe the solution for clarity. The surgeon verifies that the drug is the one prescribed, is in the desired strength, and is uncontaminated.
   b. If vial contents are to be poured into a sterile container on the tray, remove the metal seal. Using a sterile hemostat, lift the rubber stopper without contaminating the lip of the vial. To avoid reaching over the sterile field, request the surgeon to hold the glass. Verify the label again before pouring.
   c. If the surgeon is to withdraw the solution with syringe and needle, remove the metal seal, avoid contact with the inner surface and any contact with the rubber stopper, which is sterile. Next place your index and middle finger across the shoulder of the vial, support bottom of vial with your thumb, and tilt vial downward with the stopper at an angle that permits the surgeon to insert the needle and withdraw the required amount of solution.
   d. Stand by and stay alert while the surgeon injects the anesthetic solutions. He will usually first use the smallest needle on the tray to make a skin wheal and then will substitute a longer needle to infiltrate the deeper skin areas for anelgesia. Inform surgeon when he has used 50 ml. of the local anesthetic. Note the time when anesthesia began—the time of the initial injection—and record this time. The surgeon allows several minutes to elapse before proceeding with the operative procedure. During this time, he observes the patient for any untoward reaction and depends upon you to assist if an emergency should arise. Do nothing to distract the surgeon's observations. Keep unauthorized personnel from entering the area. Be ready to supply emergency treatment items stat., such as oxygen, suction, and epinephrine solution for injection from the emergency drug tray.
6. Assist p.r.n. as the operative procedure continues.
   a. Keep room and work area neat by removing articles inadvertently dropped on floor. Use unsterile forceps (not bare hands) to handle soiled sponges or other materials soiled with body fluids.
   b. Make notations in memorandum form for preparation of required reports. For example, keep a record of time: time anesthesia started is the time of initial skin injection; time operative procedure started is the time of the initial incision; time operation is completed is the time of placement of the last suture.
7. Receive and process specimen for laboratory examination. Unless otherwise instructed, handle all tissue specimens as follows:
   a. Have ready a specimen jar (with lid) half-filled with 10-percent formalin solution. However, if specimen is to be photographed, do not place in formalin because it discolors tissue. Receive such a specimen in a CRS basin and cover with a towel or gauze sponge moistened with normal saline solution.
   b. Hold container so that the surgeon may drop tissue specimen directly into container.
   c. Verify the kind of tissue by asking the surgeon what it is. Make no assumptions.
   d. Place the lid on the container.
   e. Process multiple specimens from the same patient by receiving each in a separate container and marking each label No. 1, No. 2, and so on. Verify the kind of tissue in each.
   f. Prepare a label for each specimen. Write on each label the date of operation, the patient's name (last, first, middle initial), unit or home address, rank, telephone number (work or home), the clinic or dispensary, the surgeon's name, and the kind of specimen.
   g. Use the same laboratory form (SF 515)

for all specimens, recording the number and kind of each specimen on the form.

h. Place specimen in designated place for transfer to laboratory.

i. Hand-carry specimen to laboratory at the end of the operative procedure. Give it to a laboratory technician.

NOTE

Take all tissue specimens to the pathology section of the laboratory.

8. Assist with application of dressing.
9. If you are relieved during the operative procedure by another individual, tell him what is taking place before leaving the room.

DUTIES AFTER OPERATIVE PROCEDURE

1. Check to be sure that all such items as towel clips and needles are removed before handling linen. Remove linen towels, drapes, etc., from the patient.
2. Assist in moving the patient from the table.
3. Escort the patient out of the room. He may walk or he may require litter or wheechair assistance.
4. Stay with the patient until relieved by the individual responsible for followup care.
5. Clean the room in preparation for the next case or for the next emergency.
   a. Clear the suction tubing and disconnect suction.
   b. Empty and wash suction bottle.
   c. Empty and wash waste bucket.
   d. Wet mop floor.
   e. Rearrange furniture.
   f. Replenish supplies.
   g. Place clean linen on table. Cover pad with a sheet doubled lengthwise and secured with envelope corners at head and foot (fig. 5-5). Place a lift sheet across the center, folding a sheet in quarters crosswise and fanfolding the ends to keep them from dangling over the sides of the table.
   h. Clean and return any special equipment to its proper storage place.
   i. Report any defective equipment. Label and remove it from the room.
6. Care for the instruments according to local CMS directive.

NOTE

Use great care to avoid self-injury when handling knife blades and needles. Handle with forceps and, unless otherwise directed, discard, in labeled "sharps" waste container.

7. Prepare report forms required for surgeon's completion if he completes the required report in handwriting. (If he dictates the report, prepare a memorandum to give to him. The memorandum includes identification of the patient.) The report forms include:
   a. SF 516—Clinical Record, Operation Report.
   b. SF 517—Clinical Record, Anesthesia Report.
   c. SF 515—Clinical Record, Tissue Examination.

6-32. Surgical Scrub and Glove Technique

a. General. When a medical specialist serves as a sterile assistant, a surgical scrub and glove technique is employed to eliminate, in part, controllable factors of contamination of the operative (sterile) field. Since a minimal sterile instrument and sterile drape setup is used in minor operative procedures performed in a dispensary operative facility, it is customary to perform a surgical hand scrub, put on sterile gloves, and omit wearing a sterile gown. Contact with the operative field must then be limited to the sterile gloved hands. The individual is working within a narrow margin of safety and must be exacting and precise in all movements to prevent contamination.

b. Purpose of Surgical Scrub and Gloving Procedure. Hand washing is an important asepsis factor in all patient care areas. Bacteria normally present on the skin must be reduced in number by mechanical friction, chemical applications (as with soap), and rinsing with water. These measures are essential for routine handwashing and, when properly done, will remove many bacteria classed as transient—bacteria introduced onto the skin surface by contact with soil and various other objects. Another class of bacteria, resident bacteria, are those found under the fingernails and in the deeper layers of the skin, in hair follicles, and in openings of sebaceous glands. In addition to routine handwashing, scrubbing is necessary to remove resident bacteria from the surface and just beneath the surface. However, after a time, the bacteria in deeper layers are brought to the surface of the skin by perspiration, and the bacterial count on the previously scrubbed skin surface is again very high. For this reason, sterile gloves are worn when hands must handle various sterile articles, wounds, and various body tissues. Because there is always a possibility of gloves being torn or punctured, having the under-

lying skin surgically clean provides a margin of safety when accidental damage to sterile gloves occurs. When such accidents do occur, the gloves must be changed immediately. Furthermore, the instrument, article, or body tissue area touched by the damaged glove is considered contaminated. Inanimate articles must be discarded. The body tissue area touched must be reported to the surgeon so that he will know how and when contamination occurred. Any measure taken in handling contaminated tissue is in accordance with the surgeon's order.

c. Scrub Procedure. Procedures and times for scrubbing may vary slightly. The only adequate manner in which the effectiveness of a scrub procedure can be determined is by periodic cultures taken from the hands and arms of personnel. A recommended procedure is a 10-minute surgical scrub with a standard antibacterial liquid detergent (surgical soap with hexachlorophene). Follow local directives for any variations.

(1) *Personal preparation.* The individual scrubbing must be personally clean; wear clean clothing; be free of any infection about the hands, nails, and arms; and free of any sign of a cold or other upper respiratory ailment.

(2) *Individual preparation.*

(*a*) *Fingernails.* Fingernails must be short —not visible over the tips of the fingers. Short nails permit easy cleaning and reduce the possibility of puncturing gloves. Nail polish must be removed.

(*b*) *Jewelry.* All jewelry is removed from hands and arms. A wedding band is jewelry and must be removed. It can be pinned to the pocket of the scrubsuit to prevent loss, but it must be removed from the finger.

(*c*) *Clothing.* A clean, short-sleeved, cotton scrub suit or dress is desirable. Street clothes or uniforms worn in other patient care areas should not be worn when scrubbed.

(*d*) *Cap or turban.* A clean cap, discarded daily, is worn so as to cover the hair completely. Wearing the cap or turban prevents possible contamination of the sterile field by falling hair or dandruff.

(*e*) *Mask.* The surgical mask, made of 6-layered gauze or a special, molded, plastic material, must fit snugly around the nose and mouth. Air must filter through the mask, not leak around the sides. Ideally, the mask should be worn no longer than 30 minutes or changed as soon as it becomes damp. After it becomes damp, droplets from the nose and mouth can pass through it easily. Careful handling of the soiled mask prevents the spread of organisms. It must be handled by strings only and placed in a designated receptacle; then the hands must be washed. It must never be allowed to dangle around the neck nor placed in a pocket after removal.

(3) *Surgical scrub area.* The scrub area in a dispensary is usually a scrub sink in the treatment room, unlike the separate scrub room in an OR. However, certain equipment is necessary—faucets controlled by a foot, knee, or arm lever; surgical soap dispenser with foot control; and an adjacent high shelf (above elbow level) or adjustable stand on which sterile brush, towel, and glove packages are to be placed. A clock with a second hand must be provided for timing the scrub procedure. The scrub sink area should be arranged so that the danger of contamination is lessened and splashing is eliminated as much as possible.

(4) *Scrub procedure—general rules.* Whether an operative procedure is classified as major or minor, a complete 10-minute scrub is performed when a surgical hand scrub is required. A complete scrub is also done if gloves have been punctured during the procedure. The method of timing the scrub must be such that every involved anatomical area—nails and skin surfaces of hands and arms, to well above the elbows—receives a definite number of brush strokes. A definite pattern of strokes should be followed, as each finger, then the hand, and then the arm is scrubbed, so that no area is inadvertently omitted. A recommended scrub method is illustrated and discussed in paragraph 6–33. Points which apply to the scrub procedure in general are—

(*a*) Preliminary washing time and any rinsing time must not be included in the total scrub time.

(*b*) Once the procedure is started unsterile objects should not be touched.

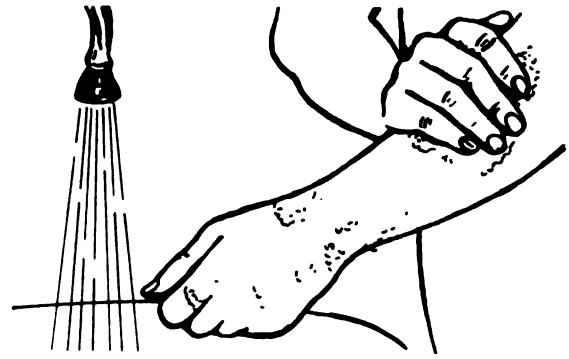
(*c*) If an unsterile object is touched the entire scrub procedure must be repeated.

6–33. Surgical Scrub and Gloving Procedure

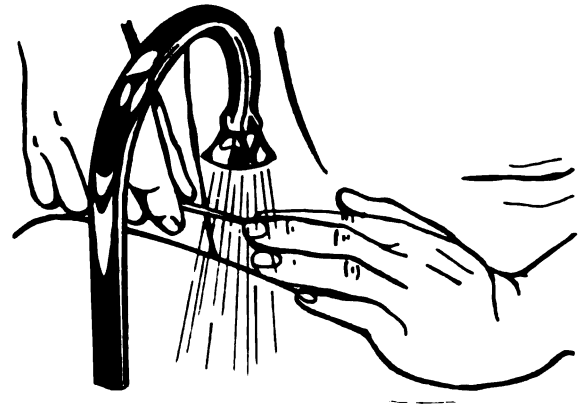
a. After complying with the requirements for personal and individual preparation outlined in paragraph 6–32, follow these steps:

Step 1. If not already done by the circulator, open the outer wrapper of the following individual packages, using aseptic technique: brush package (containing 2 brushes and 2 files or orangewood sticks), towel package (2 towels), and glove package.

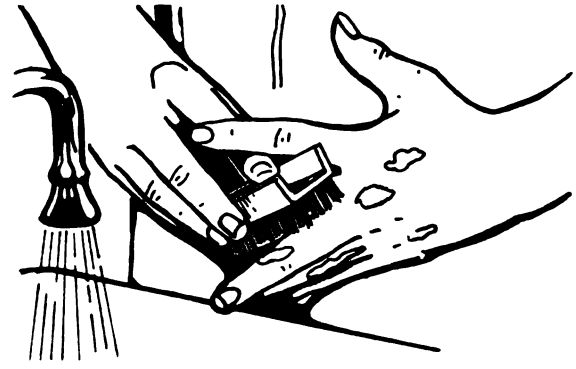
Step 2. Regulate the flow and temperature of water. Wet hands and arms. Using several drops of surgical soap, wash hands and arms to a point about 3 inches above the elbows. Rinse hands and arms thoroughly, allowing the water to run from hands to elbows. Allow water to drop off; do not shake.



Step 3. Pick up file. Clean subungual (under nails) spaces of both hands under running water. Discard file.

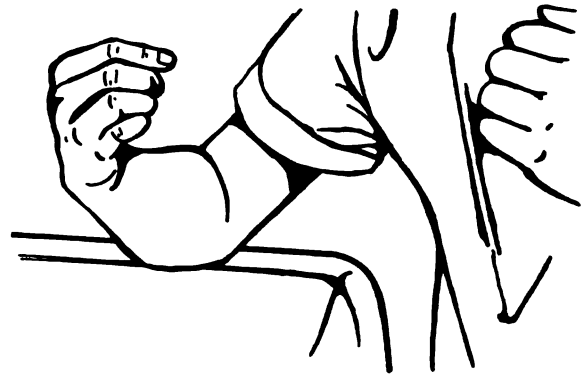


Step 4. Pick up brush, touching only the back and not the bristles. Apply several drops of detergent to wet bristles. Start timing of scrub. Scrub in a definite pattern—start at thumb, then each finger, palm of hand, back of hand, and arm; consider each part as a 4-sided object. Add water and detergent to maintain good lather. Scrub each hand and arm with brush No. 1 for 2 minutes (total time—4 minutes).



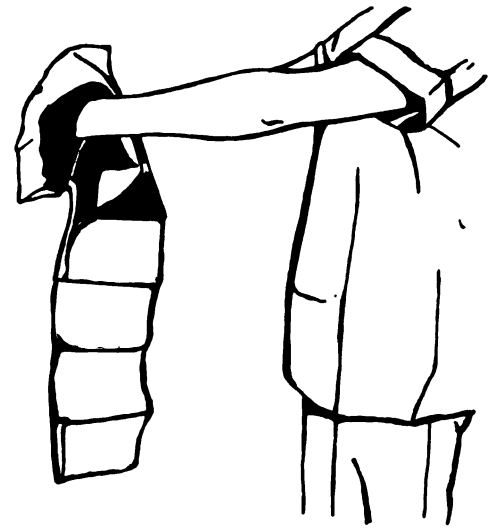
Step 5. Discard brush. Rinse hands and arms, allowing water to run from fingertips to elbows.

Step 6. Pick up second file. Clean fingernails under running water as in step 3. Discard file. Pick up second brush. Using several drops of detergent, repeat scrub as in step 4. Scrub each hand and arm with brush No. 2 for 3 minutes (total time—6 minutes). Spend 1 minute on nails of each hand and 2 minutes on each hand and arm. Rinse as in step 5.



Step 7. After rinsing, keep hands and arms up, above the waist and away from the body.

Step 8. Pick up the folded sterile towel and hold at arm's length from your body. Grasp one top corner and allow the towel to unfold to its full length. Do not allow it to touch any unsterile object or your body.

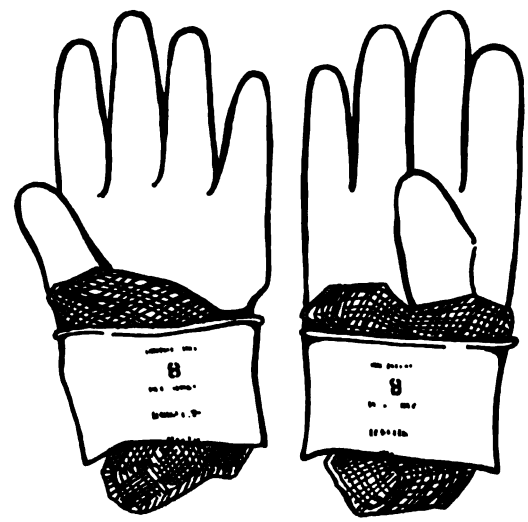


Step 9. Supporting the towel by placing one end over one hand, dry the other hand and arm. Use a blotting rotation motion. Work from hand to elbow. Do not retrace any area. Grasp other end of towel and dry other hand and arm. Use second towel if necessary. Discard towel by dropping from upraised hand into receptacle.

Step 10. Powder hands, using powder packet in glove envelope or glove cream from sterile, peel-back wrap provided by the circulator. Open sterile packet and put contents in one hand. Drop empty packet into waste container. Rub the powder or cream between fingers and over hand surfaces.

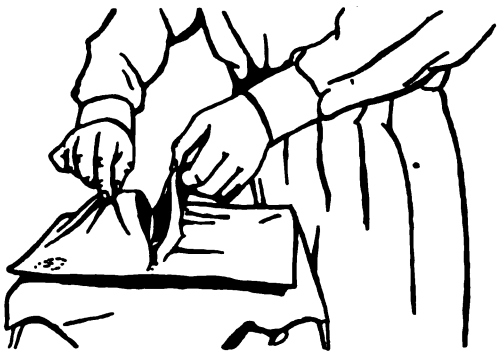
NOTE

In the illustrations for gloving, a gown is worn but the same technique is used when scrubbed but not gowned. Also, the glove pack envelope illustrated here shows how one glove in each fold is packed palms up, thumbs to outer fold corresponding to the user's right and left hand. The packaging permits removal without contamination of the outer surface of the glove—all contact with the bare hand is on the inner glove surface. The glove pack in the illustration represents gloves prepared for sterilization by steam under pressure; the gauze inserts are to separate surfaces to insure steam

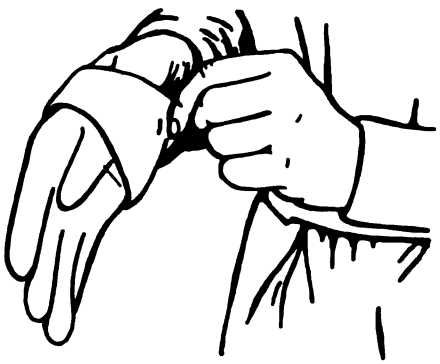


contact. Gloves packaged for sterilization by ethylene oxide gas do not require the gauze inserts. Either type may be available.

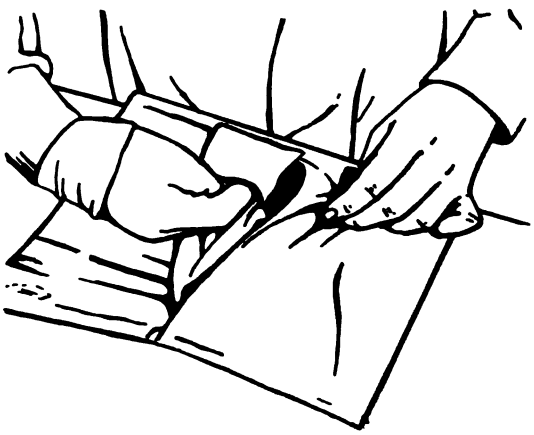
Step 11. Pinch up the flap of the envelope containing the right glove with the right hand. Grasp the glove by the folded edge of the turned-down cuff and remove with the left hand. Do not touch the other side of the envelope. Remove gauze inserts, if present, and discard without touching outer side of glove with bare hands. (If left handed, put on left glove first.)



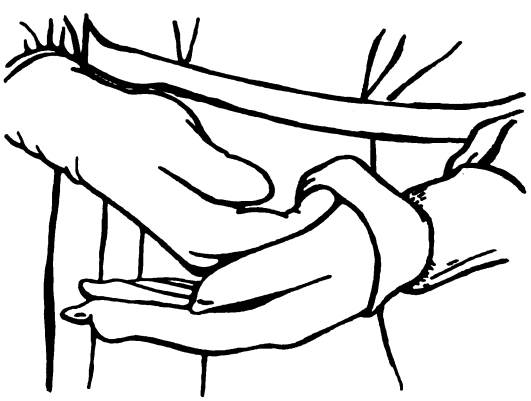
Step 12. Grasping turned-down cuff, pull the glove over the hand. Leave the cuff folded down.



Step 13. Pinch up the flap of the envelope over the left glove with the left hand. Insert the gloved fingers under the glove cuff and remove the glove. Do not allow the glove or gloved hand to touch the envelope. Discard gauze insert if present.



Step 14. Put on the left glove, keeping the gloved fingers of the right hand under the glove cuff. Pull cuff up over wrist, using care not to allow it to snap and roll. Place gloved fingers of left hand under cuff of right glove and pull cuff up over wrist.



Step 15. Adjust fingers of gloves to insure fit over fingertips.

b. Alternate Method. An alternate method of gloving is the closed cuff method. This method is preferred as the safer method when the specialist must glove himself. The specialist must, however, be wearing a sterile gown. This method eliminates several potential hazards in the glove procedure.

(1) The danger of contamination from glove cuffs rolling on skin surfaces is eliminated.

(2) The hands are not powdered and powder is not scattered on the floor or dispersed into the air.

(3) The gown cuff is anchored more securely by the glove. (The steps in TM 8–220 that require a sterile gown should be followed when this alternate method is used.)

6–34. Minor Operative Techniques—Open Wound Care

As a general rule, direct responsibility for open wound care other than the proper application of a first-aid dressing is NOT delegated to the medical specialist. Under supervision and direction of the medical officer, however, the medical specialist may be required to assist the medical officer directly with certain phases of wound care, such as preparation of an open wound for debridement or wound closure. When assisting in this fashion, the medical specialist functions as the sterile (scrubbed) assistant. The techniques discussed apply to treatment of a freshly incurred (within 6 to 8 hours of treatment), superficial, lacerated wound that does not involve nerve, large blood vessel, tendon, or deep muscle damage.

PREPARATION OF AN OPEN WOUND FOR OPERATIVE TREATMENT

Following initial evaluation of the patient's condition and the nature of the wound, the surgeon may direct the medical specialist to do a "surgical wound prep." This type of preparation is done using sterile technique.

Equipment

Presterilized prep set*
Sterile water, 1000 ml. flask
Sterile saline, 1000 ml. flask
Surgical soap
Plastic or rubber sheeting
Waste bucket
Sterile glove pack
Sterile brush pack
Sterile towel pack

* Contents of prep set may vary. Usual items required are asepto syringe, 1; sponge basins, 2; solution cup, 1; thumb forceps; hemostat forceps; gauze fluffs, 12; gauze pads, 4- by 8-inch, 6; razor and blade; scissors.

Procedure

1. With assistance of circulator, place patient in required position, removing clothing to provide free access to the circumference of the affected area.
2. Place plastic or rubber sheeting under involved area to protect table linen and other parts of the patient from moisture. Form trough with free end of sheeting for drainage into waste bucket.
3. Cut away external portion of temporary dressing, using bandage scissors; leave wound area protected by internal dressing.
4. Focus light on area to be treated.
5. Place prep set on instrument stand adjacent to involved area. Open outer wrapper.
6. Do surgical hand scrub and gloving procedure.
7. Open inner wrapper of prep set.
8. Request circulator to pour sterile water into one basin and surgical soap into cup. (Save second sterile basin for sterile saline, for use later.)
9. With hemostat forceps, remove temporary dressing. Discard forceps and dressing.
10. With gloved hand, place folded gauze pads to cover wound completely and hold pads firmly in place.
11. With gauze fluffs, water, and soap, cleanse skin area for 3 or 4 inches adjacent to wound, using friction and working outward from wound margin. Do not retrace. Discard gauze after initial use, using fresh gauze as required.
12. Clip or shave, as appropriate, any visible hair at edges of wound and in area being cleansed.
13. Repeat skin cleansing, followed by clear water rinse, using gauze fluffs.
14. Following skin cleansing and removal of hair, irrigate wound (if so directed by the surgeon), following these steps:
    a. Discard protective gauze pad which has been on wound surface.
    b. Use asepto syringe and sterile saline, flushing entire open wound area with copious amounts of solution—500 ml. or more of solution may be used. With assistance of circulator, tilt patient, if possible, to direct flow of solution from wound toward rubber or plastic sheeting trough.

CAUTION

When the wound is irrigated, bleeding may occur as clots are dislodged and

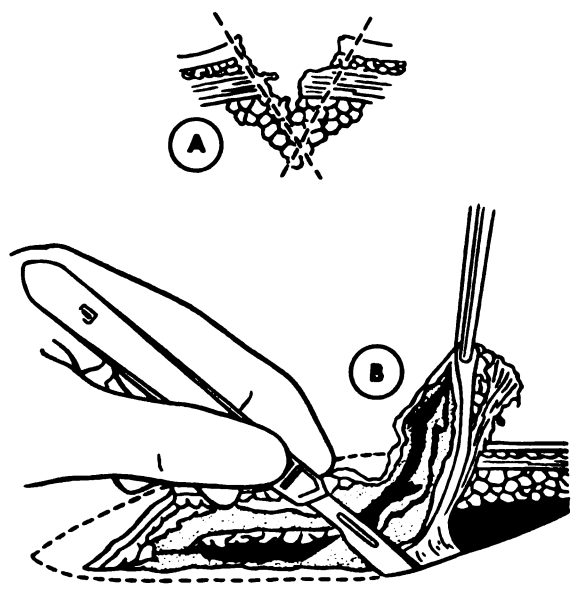
washed away. Never start irrigation procedure except under direct supervision of the surgeon, so that he may intervene immediately to identify and control the bleeding point by clamping with a hemostat or immediate ligation (tying off with suture). It may be necessary for you to apply direct firm pressure with sterile gauze to control bleeding as an interim measure until the surgeon takes over.

c. Remove visible foreign bodies (such as glass particles, gravel, bits of clothing, or detached bits of skin) that are not embedded in the tissue, using thumb forceps. Place removed particles on a gauze sponge for the surgeon's inspection. Do NOT probe into wound.

15. Following irrigation, place dry, sterile gauze pads lightly on wound surface. Dry adjacent skin area with sterile gauze.
16. Support affected body part while the circulator removes the wet rubber protector and places dry linen, as required, under the patient. Be very deliberate and gentle in all handling of the patient.
17. Place the patient in the desired position for the surgeon to continue operative treatment.
18. While the circulator places the sterile minor surgery tray in position for the surgeon, remove the prep tray from the site.
19. Remove gloves. If further assistance in a sterile capacity is required, complete a 3-minute hand scrub and put on fresh, sterile gloves.

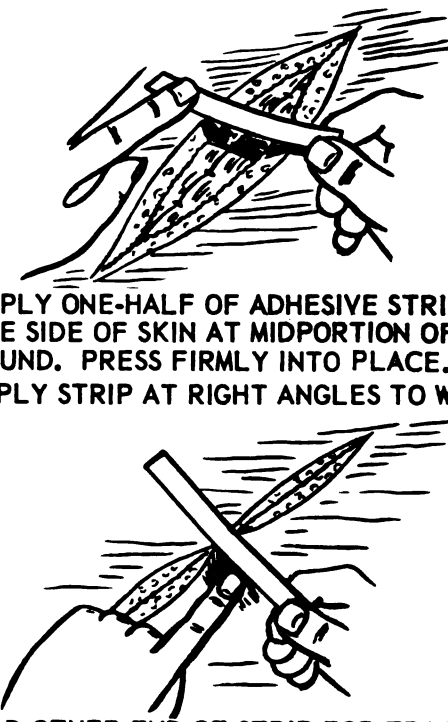
ASSISTING WITH SURGICAL DEBRIDEMENT

1. Surgical debridement involves the excision (cutting away) of all contaminated and dead tissue. The wound is enlarged, leaving clean, live tissue with freshly trimmed edges that can be apposed (brought together) for closure. In figure 6–9Ⓐ, a cross section diagram of a lacerated wound shows the irregular, damaged tissue margins that are trimmed in debridement, as indicated by the dotted lines in figure 6–9Ⓑ. The surgeon distinguishes live tissue from dead tissue by its color, consistency, contractibility, and capillary bleeding. Live tissue appears moist, pink, and firm to touch; the muscle will contract when stimulated by touch, and there will be free bleeding from cut capillary vessels. Dead tissue is described as being dark and having a mushy consistency.



A CROSS-SECTION OF LACERATED WOUND.
B EXCISION OF DEAD AND CONTAMINATED TISSUE IN SURGICAL DEBRIDEMENT.

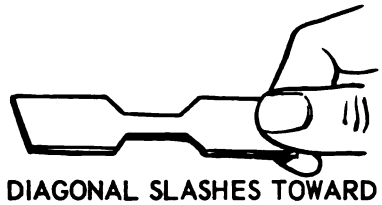
Figure 6–9. Debridement operative technique.



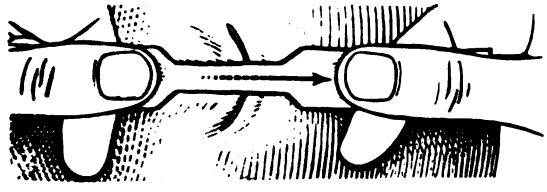
APPLY ONE-HALF OF ADHESIVE STRIP TO ONE SIDE OF SKIN AT MIDPORTION OF WOUND. PRESS FIRMLY INTO PLACE.
APPLY STRIP AT RIGHT ANGLES TO WOUND.

HOLD OTHER END OF STRIP FOR TRACTION. APPOSE SKIN EDGES EXACTLY, USING FINGERS OR FORCEPS, AND PRESS FREE HALF OF STRIP INTO PLACE.

Figure 6–10. Sutureless skin closure, sterile strip technique.



CUT 4 DIAGONAL SLASHES TOWARD CENTER OF STRIP AND FOLD UNDER EDGES TO MAKE A NONADHERENT BRIDGE. FLAME THE UNDERSIDE OF THE BRIDGE, HOLDING A MATCH OR LIGHTER JUST CLOSE ENOUGH TO SCORCH THE FABRIC. DO NOT TOUCH THE FLAMED PORTION AS THIS WILL LIE OVER THE WOUND EDGES. ALLOW HEATED PORTION TO COOL.



ATTACH ADHESIVE PORTION AT RIGHT ANGLE TO ONE SIDE OF LACERATION. PRESS FIRMLY TO ANCHOR IT TO THE SKIN. APPLY TRACTION TO OTHER END OF STRIP TO APPOSE SKIN EDGES. ANCHOR FREE END.

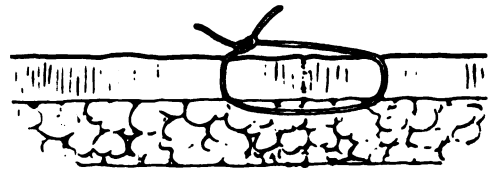
Figure 6–11. Sutureless skin closure: butterfly tape technique.

2. While performing the debridement, the surgeon identifies bleeding points and controls any excessive bleeding. If irrigation of the wound is required, the surgeon may instruct his scrubbed assistant to direct a stream of sterile saline into the wound to wash out loosened particles. Following irrigation, wet sterile drapes are removed, and fresh sterile drapes and towel clips are used.

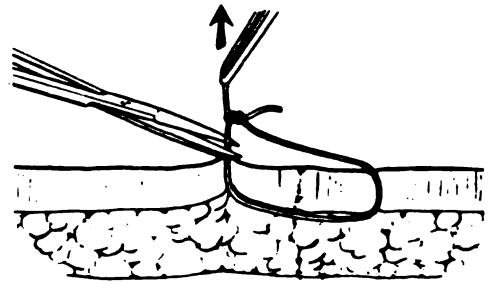
WOUND CLOSURE TECHNIQUES

The medical specialist will usually not be directly involved in the handling of wound closure materials such as suture needles or suture thread. Sterile, commercial-packed suture in plastic or foil packets is usually available for use in the dispensary, and the medical officer handles the suture and manipulates the wound tissue without direct assistance. (TM 8–220 gives background information on suture material and techniques.) The medical specialist may be directed to apply specially prepared adhesive strips for sutureless wound closure. This technique is used for closure of a small, shallow incision when gaping is minimal and skin edges can be apposed with no difficulty. Two types of sutureless closures may be used—a commercially packaged sterile strip or an improvised butterfly adhesive closure.

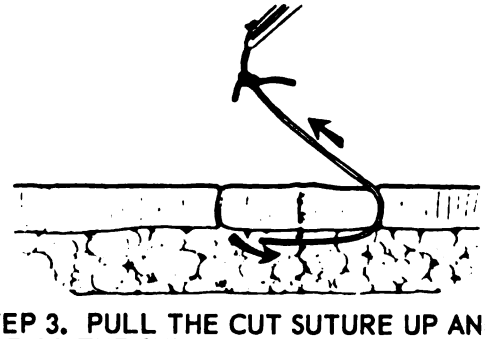
1. *Sterile skin closure strip* (fig. 6–10). These



STEP 1. NOTE THAT THE SUTURE KNOT IS LOCATED TO ONE SIDE OF THE INCISION LINE. THE SUTURE IS CUT BELOW THIS KNOT ON THE SAME SIDE.



STEP 2. GRASP ONE END OF THE SUTURE WITH THE FORCEPS AND PULL UP. MAINTAIN GENTLE TRACTION UPWARD TO EXPOSE A SMALL PORTION OF THE SUTURE THAT HAS BEEN JUST BELOW THE SKIN SURFACE. CUT THE SUTURE BELOW THE PORTION ORIGINALLY EXPOSED AT THE SURFACE. PLACE THE ROUNDED TIP OF THE SCISSORS NEXT TO THE SKIN SURFACE. (SUTURE SCISSORS HAVE ONE ROUNDED AND ONE SHARP TIP.)



STEP 3. PULL THE CUT SUTURE UP AND OUT OF THE SKIN.

Figure 6–12. Removing skin sutures.

strips are made of porous, nonirritating material and the adhesive surface is applied directly to the wound surface. Usually three ¼-inch wide, 3-inch long strips are packaged in a peel-back plastic enclosure. The strips are handled with sterile gloves and the operator may use his gloved fingers to bring the skin edges together exactly. One or more strips are used for closure. A sterile dry dressing is applied over the strips.

2. *Butterfly adhesive closure* (fig. 6–11). A butterfly adhesive closure is made from an ordinary 1-inch-wide, 3-inch-long adhesive strip. It provides less exact skin closure than a commercially prepared sterile strip, but it is a useful improvised measure. A sterile dry dressing may be applied over the butterfly strip for protection, but the surface of the strip is not sterile.

SKIN SUTURE REMOVAL TECHNIQUE

When directed by the medical officer, the medical specialist may remove skin sutures from selected patients as a postoperative care measure. In removing sutures, an essential point is to avoid pulling the end of the suture that has been exposed above the skin back through the skin, as this could implant contaminants along the suture line. A recommended aseptic technique is given and illustrated in figure 6–12. Use a sterile suture removal set consisting of scissors and a thumb forceps or hemostat forceps. As a general rule, do not apply any antiseptic solution before removal of sutures unless directed by the medical officer to do so.

Section V. INTRODUCTION TO UNIT LEVEL MEDICAL SERVICE

6–35. Field Medical Service at Unit Level

a. The Aidman Element. The field medical service begins at the unit level, with attachment of the aidman element to each subordinate company, troop, or battery of a combat battalion. The unit-level medical support provided by the aidman element is planned and directed by the battalion surgeon, the Medical Corps officer assigned as a commander of the medical element of the battalion. Unit-level medical service is covered in detail in FM 8–15. A brief discussion of the functions of the aidman at unit level, in a company aid post, is included in this manual in order to emphasize that in combat and noncombat operations, initial medical care of combat troops starts with the care provided by the aidman, MOS 91B20 (medical specialist), and with the senior medical aidman (MOS 91B40) as NCOIC of the aidman element.

NOTE

Initial unit-level professional medical treatment starts with the arrival of the casualty at the battalion aid station in the normal flow of evacuation.

b. Unit-Level Medical Service Responsibilities. Major responsibilities include the following.

(1) *In combat.* Acquire sick and wounded casualties from forward locations, administer emergency medical treatment, and evacuate patients requiring professional medical treatment.

(2) *During noncombat periods.* Unit-level medical personnel operate a unit dispensary; conduct medical MOS training; and, when required, provide instruction to nonmedical personnel in first aid, field sanitation, and personal hygiene procedures.

(3) *Throughout combat and noncombat periods.* Unit-level medical personnel maintain preventive medicine activities.

c. Functions of Aidmen In Unit-Level Medical Service Combat Support.

(1) *Aidmen.* Aidmen perform the following:

(*a*) Provide emergency medical care.

(*b*) Return to duty those patients requiring no further treatment.

(*c*) Direct ambulatory patients requiring further treatment to the company aid post or battalion aid station.

(*d*) Arrange medical evacuation for litter patients.

(*e*) Initiate field medical cards for sick, injured, and wounded patients.

(*f*) When time permits, initiate and complete field medical cards for deceased personnel.

(2) *Senior medical aidmen.* The NCOIC of the aidmen element will—

(*a*) Screen, evaluate, and provide medical treatment for conditions within his capability and return to duty those patients requiring no further attention. Patients requiring additional treatment will be evacuated to the aid station.

(*b*) Operate a company aid post near the company command post. Patients evacuated to

the company aid post remain at that location pending appropriate disposition.

(*c*) Coordinate and direct the activities of supporting aid-evacuation teams operating in the company area.

(*d*) Keep the company commander informed of the medical status in the company area.

(*e*) Report matters detrimental to the health of the command to the platoon or company commander and the battalion surgeon.

(*f*) Supervise hygiene; sanitation; and the selection, treatment, and handling of water for consumption. The senior medical aidman may serve as a member of the unit field sanitation team.

6–36. Preventive Medicine

Adequate preventive medicine practices are an important part of the unit-level medical mission at aid posts and aid stations. The medical specialist will find much of the information he needs in AR 40–5 and FM 21–10.

a. Among the preventive medicine inspections he may be required to conduct on the site are—

(1) Routine inspection of food.

(2) Messhall inspection.

(3) Barracks inspection.

(4) Inspection of water and sewage disposal systems.

b. In addition to inspection duties, he may also be required to—

(1) Keep records of personnel who must have periodic physical examinations such as food handlers and persons who handle volatile fuel material.

(2) Establish schedules and immunize personnel (AR 40–562), coordinating the schedule with the personnel officer.

(3) Instruct personnel on—

(*a*) Venereal diseases.

(*b*) Respiratory disease control.

(*c*) Intestinal diseases.

(*d*) Personal hygiene.

c. He may be required to prepare information for the monthly preventive medicine reports, which will be submitted through the unit commander either to the support unit or to the supporting division surgeon's office.

6–37. U.S. Field Medical Card (DD Form 1380)

a. General. The U.S. Field Medical Card (FMC) is the individual medical record used by aid stations and clearing stations and by nonfixed dispensaries that operate while overseas, while on maneuvers, or while attached to commands moving between stations (AR 40–400). The FMC is designed for use in forward combat areas where keeping detailed clinical records is impractical. Its main purpose is to furnish medical officers who see the casualty during evacuation with essential information about the casualty's injury or disease and the treatment given him.

b. Description. The field medical card is made so that it can be attached to a casualty. The cards are issued as a pad, each containing complete sets. A set consists of an original card, a sheet of carbon paper, a carbon protective sheet, and a duplicate. The front side of the card has spaces for the casualty's name, serial number, diagnosis, treatment, and other essential information. The reserve side of the card has space for additional entries when needed. In preparing the FMC, first remove and discard the carbon protective sheet. (Retain the carbon if the reverse side is being completed.) Unless otherwise directed, fasten the original of the FMC initiated on admission (by an aidman or personnel of the medical treatment facility) to the patient's clothing and leave it there while the patient is being transferred between Army medical treatment facilities which use the FMC as the individual medical record. Retain the duplicate in the pad for use as the theater surgeon prescribes.

c. Preparation. The U.S. Field Medical Card will be prepared by aid stations, collecting stations, clearing stations, and nonfixed dispensaries that operate while overseas, while on maneuvers, or while attached to commands moving between stations.

(1) *When prepared.* For each direct admission and for each carded for record only (CRO).

(2) *By whom prepared.* The U.S. Field Medical Card will be completed by, or under the supervision of, a medical officer of the medical treatment facility involved. Company aidmen first attending casualties in the field may initiate the U.S. Field Medical Card by recording such entries as are sufficient to identify the individual and by briefly describing medical aid given such as plasma, morphine, or splinting. The medical aidman places his initials in the extreme right portion of the space provided for signature. The U.S.

Field Medical Card will be reviewed, completed, and signed by a medical officer or his designee.

d. Source of Data.

(1) *Identification of a patient.* Information may be secured from the patient or from such things as identification tags and personnel records.

(2) *Medical information.* Medical information such as diagnosis, operations, and treatment will be entered directly on the U.S. Field Medical Card by medical officers and others attending the patient, ordinarily at the time of attendance.

e. Entries. Aid stations under conditions of extreme stress may only partially complete the U.S. Field Medical Card for patients being transferred elsewhere. Otherwise, all entries will be completed as far as possible. Figure 6–13 is a sample completed Field Medical Card.

f. Supplemental Field Medical Card. Whenever additional space is required, another FMC, labeled in the upper right-hand corner "FMC No. 2," and containing appropriate identifying information, will be attached to the original. The second card used is the Supplemental Record. More supple-

1. NAME (Last-First-Middle initial) / NOM, PRENOMS: Smith, John D. III
2. SERVICE NUMBER / NUMERO MATRICULE: RA54562591
3. GRADE / GRADE: PFC
4. NATION / NATION (e.g. State Unit): USA
5. FORCE / ARMEE: Army
6. BRANCH AND TRADE / ARME (e.g. Infantry): Lt. Weapons Infantry Man
7. UNIT / UNITE: Co B 1st Bn 119th Inf Div
8. SERVICE (Yrs) / DUREE DES SERVICES (e.g. 3 6/12): 1-6
9. AGE / AGE: 19
10. RACE / RACE: Cau
11. RELIGION / RELIGION: P
12. FACILITY WHERE TAGGED / LIEU D'ETABLISSEMENT DE LA FICHE: Aid Station 1st Bn 119th Inf Div
13. DATE AND HOUR TAGGED / DATE ET HEURE D'ETABLISSEMENT DE LA FICHE: 8 Nov 6X 1000
14. DIAGNOSIS (Including cause) / DIAGNOSTIC (Compte rendu): Wound Penetrating Abd. Involv trans colon, stomach, Oess, Pancreas involv Lft Kid. Mortar fragment near Pleiku. Evisceration. Shock
15. LINE OF DUTY / EN RELATION AVEC LE SERVICE: Yes
NATURE OF CASUALTY OR ILLNESS / NATURE DE LA BLESSURE OU MALADIE
DISABILITY / INCAPACITE
ENEMY ACTION / DU FAIT DE L'ENNEMI
16. INJURY / BLESSURE: [X] YES / OUI [ ] NO / NON
17. SICK / MALADIE: [ ] YES / OUI [ ] NO / NON
18. DATE & HOUR INJURED / DATE ET HEURE DE LA BLESSURE: 8 Nov 6X 0930
19. WHAT WAS HE DOING WHEN INJURED / QUE FAISAIT-IL LORSQU'IL FUT BLESSE: Point Scout on Patrol
20. TREATMENT GIVEN (For antibiotics specify which and give dose, hour and date) / TRAITEMENT EFFECTUE (Si des antibiotiques ont été donnés, préciser leur nature, la dose, l'heure et la date)
21. TOURNIQUET (Yes or No. Time & date applied) / MISE EN PLACE D'UN GARROT (Oui ou Non. Heure et date): No

TREATMENT / TRAITEMENT EFFECTUE	a. DOSE / DOSE	b. HOUR AND DATE / HEURE - DATE
Dry Sterile Dressing		
Dextran 300cc. (IV) Started 1015 hrs		
22. MORPHINE- 1st / MORPHINE- 1ere	15 mgs	1005 hr. 8 Nov 6X
23. MORPHINE- 2nd / MORPHINE- 2eme		
24. MORPHINE- 3rd / MORPHINE- 3eme		
25. TETANUS TOXOID / VACCIN ANTITETANIQUE		
26. A T SERUM/SERUM ANTITETANIQUE		

27. DISPOSITION-DISPOSAL / DESTINATION DONNEE AU BLESSE: Evac 44th Surg Hosp (MA) Air
28. HOUR AND DATE / HEURE ET DATE: 1030-8 Nov 6X
29. MEDICAL OFFICER (Signature & Grade) / SIGNATURE ET GRADE DU MEDECIN: Roger Jones, CPT, MC W/FC

DD FORM 1380, 1 JUN 62 — U. S. FIELD MEDICAL CARD / FICHE MEDICALE DE L'AVANT ETATS-UNIS

30. a. ABSOLUTION / CONFESSION | b. HOLY COMMUNION / SAINTE COMMUNION | c. EXTREME UNCTION / EXTREME ONCTION
d. OTHER MINISTRATIONS / AUTRES MINISTERES | e. CHAPLAIN (Signature) / SIGNATURE DE L'AUMONIER

31. DIET / REGIME ALIMENTAIRE
[ ] REGULAR / NORMAL [ ] LIQUID / LIQUIDE [X] NOTHING BY MOUTH / RIEN PAR VOIE ORALE

32. REMARKS / REMARQUES

Priority for evacuation Emergency by Air.
1025 B/P 130/80 P 100
Dextran running IV at 60 gtts per min

Figure 6–13. Sample of completed U.S. Field Medical Card.

Table 6–1. Disposition of U. S. Field Medical Card

Disposition	Original	Duplicate
COMBAT SITUATION Admission & Disposition.	OTSG	Health Record
CRO	OTSG	Health Record
Outpatient Treatment	Health Record	Destroy after 3 months
TRANSFER	To receiving facility	Health Record
NONCOMBAT SITUATION Admission or CRO with/disposition duty or health.	OTSG	Health Record
Transfer	To receiving facility	Destroy after 3 months

mental cards may be added as needed, but they will be numbered in sequence.

g. Disposition of U.S. Field Medical Cards. Disposition of U.S. Field Medical Cards is shown in table 6–1.

(1) *Completed cases.* If the patient is returned to duty or carded for record only, the original copy of the FMC is kept by the medical treatment facility making disposition of the case. Later the facility sends this copy to The Surgeon General. The card should never go with the patient to his organization. When a patient is killed in action or dies in, or on the way to, a medical treatment facility, the original is left attached to the body until it reaches the place of burial. Then it is removed for transmittal to The Surgeon General.

(2) *Transfered cases.* When a patient is transferred from one medical treatment facility to another farther to the rear, the card goes with the patient. It remains attached to him until he reaches a hospital, dies and is buried, or until he is returned to duty.

(3) *Carbon copies.* In oversea commands, carbon copies (duplicates) of FMC are used as the theater surgeon prescribes. In the United States, the senior medical officer prescribes the use of carbon copies of the cards.

CHAPTER 7

OBSTETRICAL NURSING CARE

7-1. Introduction

a. General. Obstetrics is the branch of medicine primarily concerned with the health and safety of the childbearing woman and her newborn baby. In military (and civilian) health care programs, emphasis is placed on complete maternity care, which includes special obstetrical health supervision and management during three distinct periods: (1) prenatal, (2) labor and delivery, and (3) post partum (after childbirth).

(1) *Prenatal care.* This includes the medical supervision and education of the expectant mother throughout her pregnancy. Her physical health is checked thoroughly on her initial visit to the doctor and is watched closely during subsequent regularly scheduled visits. Effective prenatal care is essentially preventive medical care, to reduce the possibility of complications developing either during or following pregnancy, to prepare the prospective mother and father for parenthood, and to increase the chances of giving birth to a healthy, normal baby.

NOTE

Although prenatal care starts with the initial visit of the pregnant woman to the doctor, it is important to emphasize that basic preparation for childbirth and parenthood should start long before the initial prenatal clinic visit; this phase of health care starts with the education of young men (prospective fathers) and young women (prospective mothers) to the responsibilities of adulthood and family living. The building of healthy attitudes toward sex, hygiene, and family living should start in early adulthood.

(2) *Childbirth.* Care in childbirth includes the assistance and management of mother and infant during and immediately following labor and delivery. Labor is the series of processes by which the fetus (unborn baby), placenta, and fetal membrane are expelled from the uterus into the outside world; delivery is the actual birth of the baby. In the normal course of events, the mother has been instructed during her prenatal period about the beginning signs of labor and about entering the hospital at that time for care and medical management. Special, segregated mother and newborn-baby care facilities are established on the obstetrics (OB) service for maternity patients. The mother and baby are separated from contact with medical-surgical patients so that the special needs of the "nonsick" mother and newborn can be met as safely as possible. Nursing personnel assigned to the OB service are usually involved in the care of obstetrical patients only, and nonassigned personnel have little or no contact with the OB patient and newborn infant.

(3) *Post partum care.* This includes the immediate care of the mother following delivery and her followup care. The post partum period is called the puerperium, which is the 6- to 8-week period of time following childbirth during which the organs of reproduction return to normal size and function. Although the mother is discharged from the hospital usually within 3 to 4 days following delivery, she is not discharged from the maternity care program until she has had a satisfactory 6-week followup physical examination and interview with the doctor. This followup care program is a means of assuring the recovery and good health of the mother and an opportunity for the obstetrician to see that the baby is under the care of a pediatrician (or well baby clinic) to assure his health and normal development.

b. Role of the Medical Specialist. In the AMEDD, the medical specialist will normally carry out any OB nursing assignment under the direct supervision of a doctor and professional nurse. Specific policies and procedures in written form are provided, covering day-to-day routine operation of ward or clinic activities and including directives for unusual circumstances. WAC medical specialists are more apt to benefit from the educational experience and training in OB clinics and wards, since it is customary to assign female nonprofessional personnel to the OB serv-

ice for direct patient care duties. However, it is the male medical specialist who is most likely to be confronted with the emergency situation of a medically unattended and imminent childbirth outside the hospital setting. In his assignment as aidman in a disaster relief situation, as dispensary specialist in an area removed from a hospital, or as a hospital ambulance attendant, he may be the only one available to aid the mother and baby. He should, therefore, have some definite information on what takes place immediately before, during, and after normal childbirth. With some background information, he will be able to give competent assistance at a time of crisis. The birth of a baby is a normal, natural, physical event, but it is also a deeply emotional experience for both the mother and the individual assisting her. In an emergency situation, the assistant must know how to help the mother help herself. The mother needs the reassurance that a competent medical specialist is present and can help her. The procedure for emergency childbirth discussed in this section is a guide for the medical specialist who is at the scene of imminent childbirth when circumstances make it impossible to obtain the services of a medical officer or nurse. Professional care must be sought as quickly as possible following the necessary emergency measures.

7–2. The Mother and Baby at Onset of Labor

A full-term pregnancy lasts approximately 280 days (10 lunar months) from first day of last normal menstrual period. To calculate the EDC (expected date of confinment), subtract 3 months and add 7 days from the first day of last normal menstrual period. The mother's body has been physiologically prepared for labor and delivery by changes that have taken place throughout the prenatal period. Similarly, the baby has grown and developed so that it is ready for existence in the outside world. Nature has therefore prepared both for this great event. The typical, normal relationships of the bodies of the mother and of a full-term baby are illustrated in figures 7–1 and 7–2.

a. The Baby and the Birth Canal. Toward the end of a full-term pregnancy, the baby has usually positioned itself head down, with the buttocks toward the fundus (fig. 7–1Ⓐ). The head-down position, with the baby's head already descended through the broad upper inlet of the mother's pelvis, brings the uterus downward and forward.

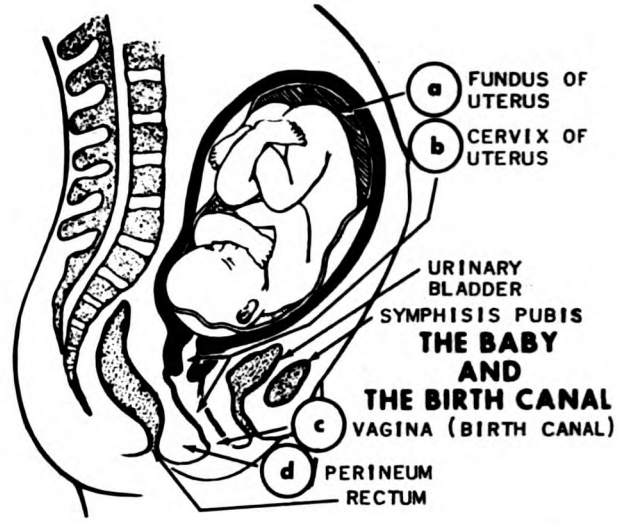


Figure 7–1. The baby and the birth canal.

The lower part of the mother's abdomen becomes very prominent. The mother has less pressure in the upper abdomen and increased pressure in the pelvic region. The baby's position is now most favorable for passage through the cervix (fig. 7–1 Ⓑ) to the vagina (birth canal) (fig. 7–1Ⓒ).

b. The Baby and Intrauterine Structures.

(1) *The uterus.* The wall of the uterus (fig. 7–2Ⓐ) becomes thin and its muscle fibers stretch and hypertrophy during the expansion of the uterine cavity to accommodate the developing baby and the essential intrauterine accessory structures (placenta, fetal membranes, and umbilical cord). The special arrangement of smooth muscle and vascular tissue of the uterus allows for great expansion in pregnancy and also for forcible contractions during labor and delivery. Addi-

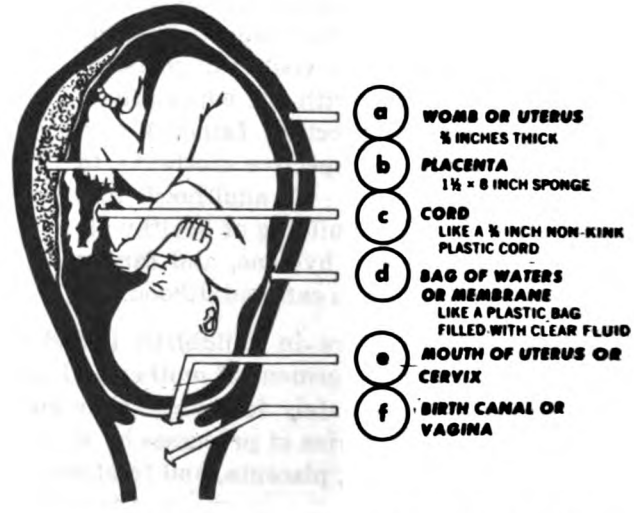


Figure 7–2. The baby and intrauterine structures.

tionally, the arrangement of muscle fibers make it possible for the uterus to contract after delivery, to constrict blood vessels, and prevent maternal hemorrhage.

(2) *The placenta.* The placenta (fig. 7–2 Ⓑ) is the special intrauterine organ that develops during the early months of pregnancy and serves the unborn baby throughout its intrauterine life. The placenta normally is firmly attached (implanted) to the inner vascular wall at the main body of the uterus. It functions primarily as a go-between organ by which the baby receives oxygen and nutrients from the mother's blood and disposes of waste products for absorption into the mother's blood. The exchange of nutrients and wastes takes place through a special sieve-like membrane in the placenta; the baby's blood and the mother's do not mix. The placenta also produces hormones, such as estrogen and progesterone to sustain the pregnancy. At full term, the placenta is about 8 inches in diameter, about 1½ inches thick, and weighs about 1 pound, varying in size and weight with the baby (it will be about one-sixth of the baby's weight). After the baby is born, the placental function is completed and the placenta separates from its attachment to the uterine wall and is delivered as the afterbirth.

(3) *Fetal membranes.* The double-walled membranous sac filled with watery fluid (bag of waters) is called the fetal membranes (fig. 7–2 Ⓓ). The inner surface of the sac is called the amnion and the fluid in which the baby floats is amniotic fluid. The amount is variable, usually from 500 to 1000 ml. The plastic-like sac of fluid insulates and protects the baby during pregnancy; during labor, a portion of the fluid-filled sac is usually forced ahead of the baby and serves as a resilient wedge to help dilate the cervix. The membranes are attached to the margins of the placenta and the placental end of the umbilical cord.

(4) *Umbilical cord.* The umbilical cord (fig. 7–2Ⓒ) is the unborn baby's life line, attaching the baby to the placenta. The cord contains three blood vessels (one vein and two arteries), in a spiral arrangement and a protective gelatinous substance called Wharton's jelly. The vein carries oxygenated blood to the fetus. The arteries carry deoxygenated blood back to the intervillous spaces in the placenta. The cord structure, plus the blood traveling through it at about 4 miles per hour, keeps the cord from kinking, which would obstruct the vital blood flow to and from the placenta. As the baby is born, the cord resembles a sturdy plastic rope; it is about 22 inches in length and about 1 inch in diameter.

7–3. Stages of Labor

For the purposes of this manual, labor is considered to progress normally in three distinct stages—

a. First Stage (Stage of Dilation). During this period, the cervix (fig. 7–2Ⓔ) becomes fully dilated, to allow the baby's head to come through from the body of the uterus to the birth canal (fig. 7–2Ⓕ).

b. Second Stage (Stage of Expulsion). During this period, the baby moves through the birth canal and is born.

c. Third Stage (Placental Stage). During this period, the placenta separates from the uterine wall, and the placenta and its attached fetal membranes are expelled from the uterus.

7–4. Recognition of the Progress of Labor (First to Second Stage)

The first signs of labor may be noticeable only to the mother as she experiences a dull, low backache and cramping pains in the lower abdomen. As labor progresses, it is important for the mother and the assistant to be aware of the significance of signs, which although variable, are typical and will be noticeable to both.

a. Irregular contractions become regular, last longer, and become stronger. The medical specialist should know how to time and evaluate the force of contractions by a method that is more accurate than just observing the patient's actions or facial expression, since patients react differently. A recommended method is as follows:

(1) Place your hand on the patient's abdomen, just above her umbilicus, to feel the involuntary tightening and relaxation of the uterine muscles.

(2) Time the contraction (in seconds) from the moment the uterus first tightens until it is completely relaxed. Time the interval (in minutes) from the start of one contraction to the start of the next. The intensity, whether or not the patient complains of pain, is evaluated by the sense of hardness felt during the contraction; with an intense (strong) contraction, the fingers cannot indent the abdominal surface.

(3) When contractions recur at regular 3- to 4-minute intervals, last from 50 to 60 seconds (or longer), and feel very hard, the patient is considered to be in the latter part of the first stage of labor. The cervix is probably dilating rapidly. She should not be walking about and should not be left alone—the second stage will probably begin very soon.

b. Membranes may rupture ("bag of waters broken"). In addition to increasing frequency, duration, and intensity of contractions, there may be a rupture of membranes during the first stage, which would be indicated by a gush of watery fluid from the vagina. Some blood-tinged mucus ("bloody show") may appear on the patient's clothing, also. As labor progresses, both will probably increase. In an emergency situation, no attempt should be made to wipe away secretions from the vagina since extreme care must be used to prevent any contamination of the birth canal. When these vaginal discharges are present, it is usually advisable to keep the patient lying down. If a clean towel is available, it can be placed under her buttocks to absorb any moisture. Check the fetal heart sounds following membrane rupture. Lack of sounds may indicate a possible cord prolapse.

c. During the first stage of labor the mother should be encouraged to relax and "let herself go" with each contraction. As each contraction starts, abdominal breathing or quiet breathing with mouth closed will help this relaxation. She will waste strength and energy by attempting to bear down or push.

d. Toward the end of the first stage of labor, there will be a noticeable increase in the strength and frequency of contractions and an increasing sense of pressure on the rectum. There is involuntary contraction of the abdominal muscles and an increasing feeling of urgency by the mother to bear down and push, as for a bowel movement. This indicates she is rapidly nearing the second or expulsion stage—the cervix is probably fully open, and the baby is beginning its passage through the birth canal (fig. 7–3). The mother will often make an involuntary deep grunting moan with each increasingly strong contraction. The medical specialist must now be prepared to assist with the imminent delivery of the baby.

7–5. Assisting With an Emergency Delivery (Second Stage of Labor)

a. General Instructions.

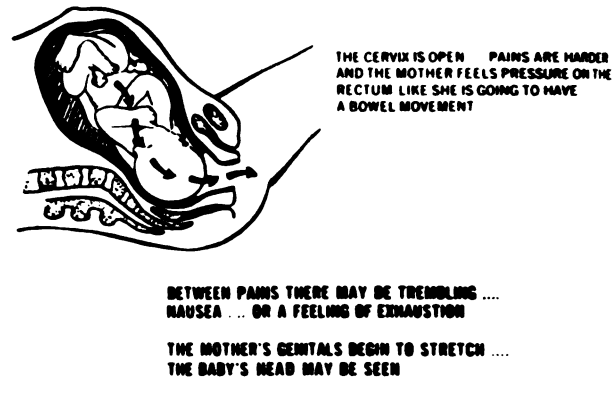

SECOND OR DELIVERY STAGE
THE CERVIX IS OPEN PAINS ARE HARDER AND THE MOTHER FEELS PRESSURE ON THE RECTUM LIKE SHE IS GOING TO HAVE A BOWEL MOVEMENT
BETWEEN PAINS THERE MAY BE TREMBLING .... NAUSEA ... OR A FEELING OF EXHAUSTION
THE MOTHER'S GENITALS BEGIN TO STRETCH .... THE BABY'S HEAD MAY BE SEEN

Figure 7–3. Beginning of second stage.

(1) Be calm. Reassure the mother that you are there to help her with the delivery.

(2) Use aseptic technique to the greatest extent possible under the circumstances.

(3) Be prepared to administer first aid measures for both mother and baby. These measures include possible respiratory and cardiac resuscitation for the baby, in addition to prevention of shock and control of hemorrhage for the mother.

(4) Protect the mother to the greatest extent possible from onlookers or curious bystanders.

b. Desirable Equipment. A basic sterile obstetric pack should be available for use at the time of an emergency delivery in every ambulance dispatched to an emergency maternity call or in every dispensary subject to such an emergency call. This commercially prepared item is sealed in a plastic envelope. A similar pack may be prepared by a local CMS unit.

(1) The recommended equipment includes the following items:

Sterile pack, containing—
- Sheets, 3
- Towels, 4
- Pads, gauze, 4 inch x 4 inch, 12
- Sanitary pads, 2
- Syringe, rubber, 1*
- Blanket (baby receiving blanket), 1

In carton or outside of pack—
- Sterile gloves
- Germicide wipes, foil-wrapped

* The recommended syringe (fig 7–4) is called an "ear and ulcer syringe." It is used for gentle p.r.n. aspiration of secretions from the baby's mouth.

(2) If no sterile equipment is available, use the cleanest items at hand—towels or parts of the mother's clothing. If newspapers are available, place some under her. When possible, place a rain-

Figure 7–4. Syringe, ear and ulcer.

coat or blanket under her if she must lie on the ground.

c. Preparation for the Delivery.

(1) Assist the patient to lie on her back with knees bent and separated as far apart as possible.

(2) Remove any constricting clothing or push it above her waist.

(3) Have the best possible light directed toward her genital area. Observe for gapping of the vagina and bulging of the perineum (fig. 7–1Ⓓ). With each contraction, the baby's head may be visible (fig. 7–5 Ⓐ) as the labia opens wider.

(4) If equipment is available—

(*a*) Cleanse your hands with germicide wipes.

(*b*) Place pack convenient to use. Open pack.

(*c*) Remove one sheet, touching only the corners.

(*d*) Between contractions, when the mother can concentrate on what you are telling her to do, ask her to raise her hips. Place one fold of the sheet well under her hips and unfold it toward her feet.

(*e*) If time permits, use a second sheet to cover lower abdomen and legs, leaving perineal area uncovered. (Apply in diamond shape, turning back fourth corner, as in figure 5–32).

(5) Do not touch the vaginal area at any time.

(6) Put on sterile gloves, if available.

(7) Watch for emergence of the top of baby's head at the vagina. This is called crowning (fig. 7–5 Ⓑ). Be prepared to support the baby's head as it emerges.

(8) As delivery is imminent (head crowning), get mother to pant with contractions. Permit the head to deliver between contractions, if at

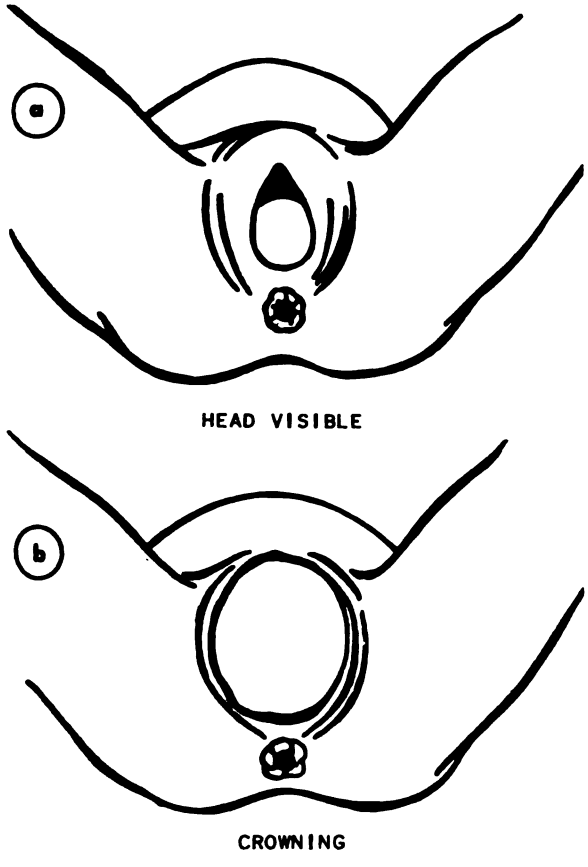


Figure 7–5. Second stage: crowning.

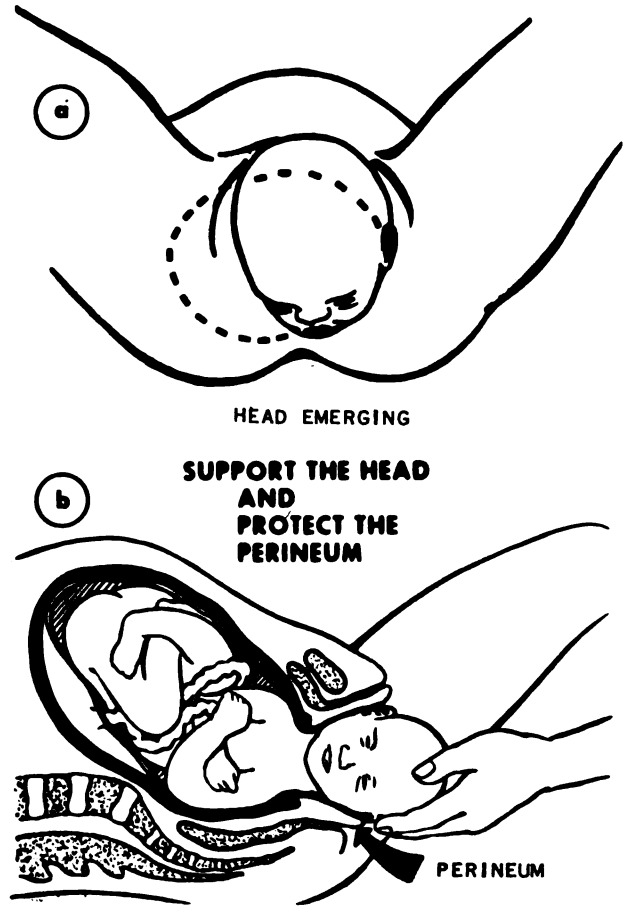


Figure 7–6. Second stage: support for head.

CONTROLLED DELIVERY OF THE HEAD

Figure 7-7. Second stage: cradling head between hands.

all possible. This will avoid perineal tears and trauma to infant's head by sudden release of pressure.

d. Delivery of the Baby.

(1) As the baby's head is born, it usually is face down; it then turns so that its nose is toward the mother's right or left thigh (fig. 7-6 Ⓐ).

(2) Support the head by cradling it (fig. 7-6 Ⓑ and fig. 7-7), between your hands. Do not pull or exert any pressure.

(3) To help the upper shoulder out, support the head in a downward position. To help the lower shoulder out, support the head in an upward position. As the shoulders emerge, be prepared for the rapid emergence of the rest of the baby's body—the head and shoulders are the widest parts and take longer to emerge.

(4) Use a sterile towel (or the cleanest article available) to receive the baby. Note the time, if possible, when the baby is born.

(5) As soon as it is completely delivered, pick the baby up to allow mucus and fluid to drain from its nose and mouth. Be sure you have a firm hold as a newborn baby is very slippery. Grasp the baby at the ankles, slipping one of your fingers between them, and support shoulders with your other hand, with thumb and middle finger around neck and forefinger supporting the head (fig. 7-8).

(6) Do NOT pull on the cord when picking the baby up. Raise the baby's hips slightly higher than its head for drainage. It will probably breathe and cry almost immediately. Soon after this cry, the cord will become limp and will no longer pulsate. The blood flow ceases since the baby no longer needs it.

HOLDING THE BABY

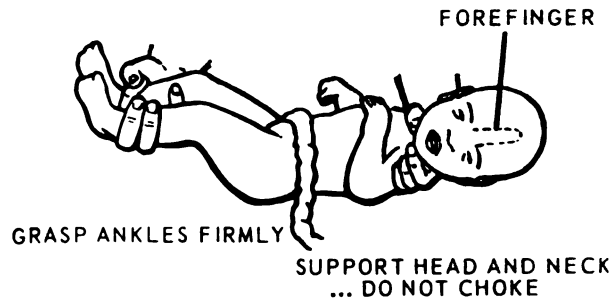


Figure 7-8. Holding the baby.

(7) If there seems to be excessive mucus, use your finger to clear the baby's mouth gently or use gentle suction with the rubber syringe. Support the baby by placing him on the mother's abdomen. The lowered head position can be maintained when clearing mucus by finger or syringe—do not attempt to support the baby in midair while holding it only by its feet.

(8) As soon as the baby is breathing and crying, wrap it in the blanket (if available). Do not pull on the cord. Do not tie the cord. The cord will usually be long enough for you to place the baby on the mother's abdomen. Help her to hold the baby there, in a side-lying position.

7-6. Delivery of the Placenta (Third Stage of Labor and Delivery)

a. Observe the appearance of the cord and its location at the vagina. As the placenta separates from the uterus, the cord will appear longer.

b. Place one hand on the mother's abdomen and feel for a definite contraction. The contracting uterus should feel like a hard, grapefruit-sized ball.

c. Wait for the delivery of the placenta. Ten minutes or longer will usually elapse before the placenta is delivered. Never pull on the cord to check for separation of the placenta. As the uterus contracts, encourage the mother to bear down to expel the placenta and membranes.

d. When the placenta appears at the vagina, grasp it gently and rotate it (fig. 7-9). Do not pull, but slowly and gently guide the placenta and attached membranes (fetal sac) from the mother's body.

e. Do not cut the cord. Wrap the placenta in a sterile towel. Place it next to the baby. Wrap the

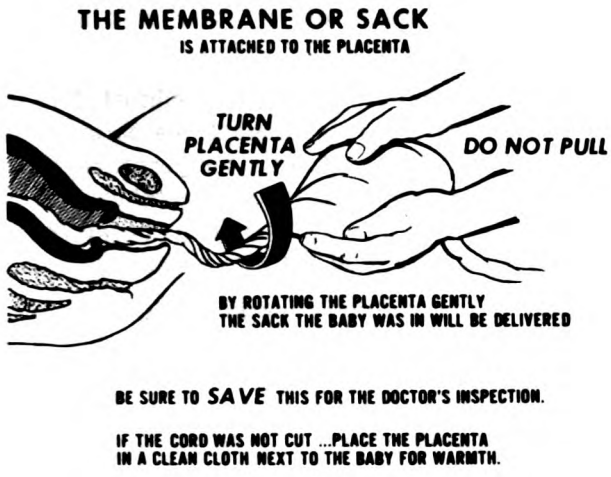

THE MEMBRANE OR SACK
IS ATTACHED TO THE PLACENTA
TURN PLACENTA GENTLY
DO NOT PULL
BY ROTATING THE PLACENTA GENTLY THE SACK THE BABY WAS IN WILL BE DELIVERED
BE SURE TO SAVE THIS FOR THE DOCTOR'S INSPECTION.
IF THE CORD WAS NOT CUT ...PLACE THE PLACENTA IN A CLEAN CLOTH NEXT TO THE BABY FOR WARMTH.

Figure 7–9. Delivery of placenta.

baby and placenta together in the third sterile sheet from the pack and place both in the mother's arms.

f. Check amount of vaginal bleeding. A small amount (one or two cups, or less than 500 ml.) is expected.

g. Remove soiled sheet. Save all evidence of blood loss (stained sheet or towels) for doctor's examination.

h. Place two sanitary pads over vaginal and perineal area, touching only outer surface and placing from vaginal toward perineal area. Assist mother to place thighs together to hold pads in place.

i. Cover the mother and baby for warmth but do not overheat.

j. Check the baby's color and respirations. Encourage him to cry vigorously by gently flicking the soles of his feet with your finger.

k. Continue to check the feeling of hardness in the uterus. You should be able to cup your hands on either side of a firm hard ball about at the level of the mother's umbilicus (fig. 7–10). This is known as "guarding the fundus." If the fundus feels soft, use gentle massage to stimulate a firm hard contraction—this prevents bleeding.

l. Stay with the mother for at least 1 hour after delivery, unless relieved by competent personnel. The immediate post partum period when hemorrhage may occur is dangerous for the mother. Check the fundus, her pulse, and skin temperature. Watch for any signs of shock. Check vaginal pads for amount of bleeding without touching surface in contact with vagina.

Figure 7–10. Third stage: checking fundus.

7–7. Special Points in Emergency Delivery

a. Avoid touching the vagina at any time, as there is great danger of infection.

b. Do not worry about tying the cord or cutting the cord. When the baby first cries, the circulation from baby to cord normally ceases, and clots form to seal off the umbilical blood vessels. The cord must only be cut under strict aseptic conditions because of possible infection. Leaving cord and placenta attached to the baby may be a bit messy, but it is safe.

c. Note time of birth and approximate location for legal registration.

d. If baby does not breathe spontaneously, clear mouth of mucus (fig. 7–11 Ⓐ). Stimulate crying by gently rubbing back. If this fails, give extremely gentle mouth-to-mouth resuscitation. Hold head back, jaw up, and breathe gently into nose and mouth with small puffs—20 per minute (fig. 7–11 Ⓑ).

e. If baby seems to have excessive amount of mucus after clearing its mouth, keep baby on side, in slight head-down position for gravity drainage. Turn baby from side to side to assist in aeration of lungs. Be extremely gentle when introducing your finger or the tip of the syringe into the baby's mouth.

f. If an unusual situation seems to be present —that is, the progress of labor and delivery seems other than described—

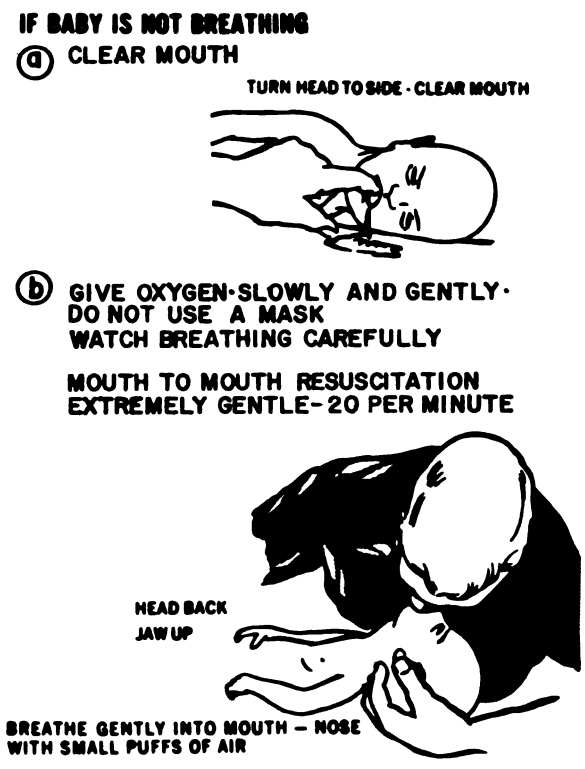

IF BABY IS NOT BREATHING
ⓐ CLEAR MOUTH
TURN HEAD TO SIDE - CLEAR MOUTH
ⓑ GIVE OXYGEN-SLOWLY AND GENTLY-
DO NOT USE A MASK
WATCH BREATHING CAREFULLY
MOUTH TO MOUTH RESUSCITATION
EXTREMELY GENTLE-20 PER MINUTE
HEAD BACK
JAW UP
BREATHE GENTLY INTO MOUTH – NOSE
WITH SMALL PUFFS OF AIR

Figure 7–11. Breathing assistance.

When in doubt, do nothing.
Get the mother to a hospital—fast.
Get medical advice by radio or telephone.

7–8. Hospital Admission of Patient in Labor

NOTE

The specialist in obstetrics will usually be female (WAC); the use of the term "he" is only for the purpose of continuity with the rest of the manual.

a. When a patient presents herself to the labor room, greet her cordially. If her husband is with her, instruct him where he can wait until the doctor evaluates the patient to see if she should be admitted. First impressions will frequently influence the patient's attitude and feelings throughout the labor and delivery process. As you prepare the patient for the doctor, obtain the following information:

- Contractions—onset, frequency, duration, length of time between.
- Bleeding, if any.
- Membranes ruptured or leakage of water from vagina.
- EDC.
- Number of pregnancies, number of live children.
- Time of last meal and whether she had anything to drink.

When a patient is ordered to be admitted to the ward, her prenatal record should be obtained. At this time also, the patient's temperature, pulse, respiration, and blood pressure are taken, and the fetal heart tones are checked. The operative permit for anesthetic and delivery should be signed.

b. After the patient is checked by the physician or the nurse and the status of labor established, a prep (para 5–103) is done. Depending upon local policy, the pubic and perineal area *or* just the perineal area is prepped. If no contraindication, such as bleeding, rupture of membranes, or advanced stage of labor is present, an enema is usually ordered. This will stimulate labor, evacuate the rectum, and lessen the chance of contamination of the sterile field as the baby is delivered. A urine specimen is also obtained.

c. The specialist may be required to assist with the monitoring of the patient's progress as well as giving emotional support. The specialist will help time contractions, check the blood pressure, and listens to the fetal heart tones. Any of the following must be reported to the nurse or physician immediately:

- Sudden increase or decrease in blood pressure.
- Fetal heart tones below 120 or above 160 beats per minute.
- Vaginal bleeding.
- Rupture of membranes.
- Impulse on part of mother to "push."

Emotional support includes staying with the patient as much as possible and making her as comfortable as possible. The specialist can sponge the patient's face and hands from time to time; give her ice chips (or a drink of water or tea with sugar, if not contraindicated); rub the lower part of her back; see that some fresh air is present; change her gown and/or bed linens if they get damp or soiled; and position patient on her side, if permitted.

7–9. Labor or Birth Complications

a. Uterine Inertia. Contractions so weak that they may cease entirely or be unable to force the baby out of the uterus.

b. Precipitate Labor. One that is very short with severe contractions. This may involve delivering the baby without a doctor and under unsterile conditions. Trauma can affect both mother and baby due to the severity of the labor.

c. Abnormal Presentation. Face, hand, foot, or buttocks presented first, rather than the head.

d. Cephalopelvic Disproportion. Birth canal too small to permit the baby's head to pass through the pelvis.

e. Cesarean Section. A surgical procedure that involves removing the infant by making an incision in the abdomen and uterus. Repeat Cesarean sections are usually required in future births.

f. Ruptured Uterus. A rare condition in which the uterus splits from strain on the muscular wall due to severe labor contractions or to obstructed labor.

g. Prolapsed Cord. A serious complication in which circulation to the fetus is cut off and asphyxiation results. The umbilical cord may drop through the cervix after the membranes have ruptured. The cord may become compressed between the presenting part and the pelvic wall, thus cutting off fetal circulation.

h. Toxemia. A common condition in pregnancies (about 1 out of every 20). It occurs most frequently in the last months of pregnancy and is most likely to strike young women who are pregnant for the first time (primigravida) or women with a multiple pregnancy. Its symptoms can develop in a day or even less, so the specialist must be ever vigilant and report immediately to the nurse or doctor any patient who shows any of the following symptoms:

- Sudden weight gain.
- Blurred vision or spots before the eyes.
- Edema of the face, fingers, legs, or feet.
- Decrease in urinary output.
- Severe persistent headache.
- Persistent vomiting.
- Elevated blood pressure such as 140/90 or above.
- Albumin in urine.
- Mental confusion or disorientation.

There are two stages of toxemia—

(1) *Preeclampsia.* A previously normal pregnant patient develops one or more of the symptoms.

(2) *Eclampsia.* In addition to any or all of the other symptoms, the patient has convulsions. Eclampsia can usually be prevented if the patient is carefully watched. Accurate observation and reporting are required because eclampsia is one of the most severe complications of pregnancy. Patients with eclampsia should be kept in a quiet room. Maternal mortality is from 5% to 15%; fetal mortality is about 25%.

i. Fetal Distress. This is indicated by a change in fetal heart tones (either an increase to above 160 beats/minute or a decrease below 100 beats/minute), rapid excessive movements of the fetus, and/or the presence of meconium in the vaginal discharge when the presenting part is the head. Fetal distress may result from premature labor, prolapsed umbilical cord, toxemia, or hemorrhage due to placenta previa (note 1) or to placenta abruptio (note 2). When this condition occurs, labor may be started early, or an unexpected Cesarean section may have to be done. In the latter instance, the specialist must move rapidly to get the needed equipment ready.

NOTE 1

There are three types of placenta previa (painless bleeding)—

(1) Centralis—placenta has been implanted in the lower uterine segment and completely covers the cervix.

(2) Lateral—placenta lies in the lower uterine segment but does not cover any part of the cervix.

(3) Marginal—placenta partially covers the cervix.

NOTE 2

Placenta abruptio is a condition in which the placenta prematurely separates from the uterine wall. Patients with this condition have a painful, rigid abdomen with no visible bleeding.

j. Other Complications. These include hemorrhage and severe chronic disease in the patient (chaps. 5 and 8).

7-10. Post Partum Care of Mother

The mother is observed closely for several hours after delivery. Since she is often chilled, a blanket should be readily available. The first hour of post partum is the most critical one for the mother. It is during this time that post partum hemorrhage is most likely to occur as a result of uterine relaxation. The fundus should be checked at least every 15 minutes. In those patients whose uterus tends to relax, the fundus should be watched almost constantly. Firm massage over the fundus helps the uterus contract to a firm mass about the size of a grapefruit. The fundus is usually slightly below

the umbilicus unless the bladder is full. Check pads for amount of bleeding. Pulse, blood pressure, and distention of bladder must be checked frequently during this period. The following should be observed during the post partum period:

a. Lochia. This is a normal vaginal discharge consisting of blood and lining from the uterus which occurs in diminishing amounts in the early post partum period. The first 3 to 4 days, the lochia is bloodstained. Gradually, the color becomes brownish, and by the tenth day, the discharge is usually a yellowish-white. A foul odor to the lochia may be an indication of interuterine infection. The presence of blood in the lochia after the tenth day is abnormal. In both of these instances, the doctor should be immediately notified.

b. After Pains. Painful cramps may occur as the uterine muscles contract. This is especially noticeable when patient is nursing the infant. This usually occurs in multipara patients and lasts 3 to 4 days.

c. Bladder. This should be observed for distention as it may become distended without any awareness by the patient. Patient must void or be catheterized q. 6–8 hours. If the fundus remains above the umbilicus and cannot be massaged down, it is a good indication that the bladder is full. To check the amount of urine in the bladder, measure area between bottom of fundus and pubic arch. The bladder should be checked by palpation after voiding to be sure it is empty. Frequently, muscle tone of the bladder is lost for varying periods after delivery and there is retention of urine.

d. Breasts. A good supportive brassiere should be worn day and night from the first day after delivery whether the mother plans to breast feed or not. If not breast feeding, and depending upon local policy, a lactation prevention medication may be given at time of delivery. Support and normal hygiene is usually all that is necessary. When the milk starts coming in (2–3 days after delivery), engorgement (hardness of breasts) may occur in some women. This usually disappears in about 24 hours. DO NOT stimulate the breasts by expressing the milk; leave alone. If the mother is breast feeding, a good nursing brassiere should be worn day and night. Since the procedures for cleaning the nipples and teaching mother and baby how to breast feed vary widely, check with the nurse or the physician in each instance.

e. Perineal Area. All patients receive perineal care; however, if the patient has had an episiotomy (incision in the perineum during delivery), she must be exposed to thermolite treatments (gooseneck lamp or patient's bed lamp with a no stronger than 40-watt bulb which is placed 10–12 inches from the perineum) several times daily to insure that the area is kept clean and dry. In any perineal care, cleansing is accomplished from the pubic area toward the rectum to avoid contamination with feces. Fresh tissues are used for each stroke.

f. Early Ambulation. In most hospitals the doctor will want the mother up 4 to 6 hours after delivery, depending on the anesthesia given during delivery. The specialist should get the patient up slowly to prevent dizziness and assist on the first trip to the bathroom (remaining with the patient) and as often afterwards as necessary.

g. Bathing. The patient has a daily bath or shower, as the doctor orders.

h. Exercises. A routine system of simple exercises designed to tighten muscles overstretched during pregnancy and to correct basic posture can be started 24 hours after delivery. These exercises are frequently taught by the physical therapy section.

7–11. Immediate Care of Baby

a. After the physician has finished working with the baby (this usually includes suctioning the respiratory tract, clamping and cutting the umbilical cord and instilling medication in the eyes to prevent possible gonorrheal infection, although the nurse may do the latter), he hands the baby to the nurse who has a warm blanket and bassinet ready. During this time and afterward, there must be a *constant observation* of the baby for any respiratory distress and excessive mucus, which would necessitate immediate suctioning. Resuscitation tray with endotracheal tube and laryngoscope must always be available if needed by doctor. An APGAR score is noted by the nurse or physician at one minute after birth. The APGAR "score" or scale is an aid in making an evaluation of the success and the speed of the newborn's initial adjustment to extra-uterine living. Five signs are evaluated and scored as indicated in table 7–1. The total score of the five signs is 8 to 10 when initial adjustment is good. Lower scores require special attention.

b. Before the newborn is taken from the delivery room, the nurse or specialist must apply identification bands to both wrists or ankles. These

Table 7-1. APGAR Scale for Evaluating Condition of the Newborn

Sign	Score		
	0	1	2
Heart rate	Absent	Slow, below 100	Over 100
Respiratory rate	Absent	Slow, irregular	Good cry
Muscle tone	Limp	Flexion of arms or legs	Active motion
Reflex instability*	No response	Grimace	Cough or sneeze
Color	All blue or all pale	Body pink, extremities blue	Completely pink

*Tested by insertion of catheter tip into nostril.

bands show mother's name, infant's sex, date, time of birth, doctor's name, and mother's register number.

c. If the baby is in poor condition and the parent's religion requires baptism, immediate arrangements should be made. Anyone can baptize, but the form is important and a record should be made on the mother's chart, along with the name of two witnesses, whenever possible. If a nurse or a specialist must baptize a baby, this procedure should be followed:

(1) Pour a small amount of water on the baby's face or forehead.

(2) While pouring, say "I baptize you in the name of the Father and of the Son and of the Holy Ghost (Spirit)," or if the baby may be dead, "If you are alive, I baptize you in the name of the Father and of the Son and of the Holy Ghost (Spirit)."

7-12. Newborn Nursery

Infants born in the hospital are normally admitted to the nursery. The important policies in table 7-2 that maintain cleanliness and reduce contamination for protection of the babies are a "must" in this area.

7-13. General Care for Newborns

a. Observation. The infant is observed for—

(1) Cyanosis.
(2) Hemorrhage.
(3) Rapid, labored, grunting respirations.
(4) Vomiting or choking.
(5) Redness or discharge from eyes.
(6) Redness around the cord.
(7) Thrush (redness of tongue and mucous membranes of the mouth and closely adherent white patches).
(8) Diarrhea.
(9) Jaundice.
(10) Rash of any kind.
(11) Temperature elevation.
(12) Failure to pass meconium 12 hours after birth or failure to urinate.

Table 7-2. Policies for Newborn Nursery

DO—	DO NOT—
Clean nursery by wet mopping several times a day	Do NOT use curtains or any other type of dust-catcher in the nursery.
Wipe *all* equipment with disinfectant *every* day.	
If authorized to enter the nursery, report to the nurse in charge if you have any sore throat, skin infection, or any other infectious condition.	•Do NOT permit unauthorized personnel to enter the nursery.
Scrub hands for 5 minutes when reporting on duty or after using latrine.	
Move around the nursery and check each unit, as constant vigilance is required. Prematures need closer observations than normal infants.	•Do NOT give information about infants to anyone except the parents or as directed by the nurse.
Wash hands thoroughly before touching an infant	•Do NOT go from one infant to another without washing your hands.
Provide each infant with his own crib and stock of supplies	•Do NOT use the same equipment for two infants.
Place soiled diapers in step-on cans with lids and remove from the nursery periodically.	•Do NOT put soiled diapers on the infant's crib or on the floor.
Autoclave any linen coming into the nursery.	
Change from uniform to scrub suit in the nursery dressing room. Caps and masks may be required.	

b. Identification Band. This band must be checked each time the baby is given to its mother or to the nurse. Bands for premature infants are usually taped to the isolette and placed on the baby when it has attained added weight.

c. Other Identification. Palm or footprints of the baby and the mother's fingerprints may be taken as an added precaution.

d. Measurements. Infant is weighed, length is measured, and circumference of head and chest is measured. Infant must be protected from chilling during these procedures.

e. Skin Care. In most nurseries, babies are *lightly* washed with hexachlorophene and water and cotton sponges. Some of the vernix caseosa (a greasy white, cheesy-like substance covering the baby at birth) will remain, particularly on the head, but will gradually absorb and wear off. Any gross blood is removed the same way.

WARNING

Gauze or terry washcloths must *not* be used as they will irritate the baby's skin.

The buttocks are cleaned the same way, rubbing as little as possible. The eyes are washed with sterile water.

f. Cord Care. The area around the cord must be kept clean. Dressings are *not* added unless the doctor orders. The cord is usually swabbed with a solution of 70% alcohol or hexachlorophene.

g. Temperature. A separate thermometer is used for each infant. Rectal temperature is taken on admission to the nursery and every 4 hours until stabilized; thereafter, it is taken only once a day. The temperature usually drops to 96° F after birth, then gradually climbs to 98° F or 99° F. Any deviation should be reported. Depending upon your local policy, the infant is placed in an incubator if the temperature is below 97.6° F until temperature rises.

h. Elimination. The time the baby first voids should be recorded, as well as the character (usually clear), and the time of the first stool, which will be composed of *meconium* (tarry green substance). The number and type of bowel movements thereafter should also be recorded. Mucus, blood, or curds in the stool should be recorded at once.

i. Feedings—Newborn Infant.

(1) The normal newborn is kept NPO the first 12 hours or as ordered, then given a preparation of glucose water for the first two feedings. After the glucose water, the infant is fed by breast, or a prescribed formula is given every 4 hours.

(2) The premature infant is kept NPO the first 24 hours or as ordered, and then given a preparation of glucose water or a formula feeding as prescribed by the pediatrician.

j. Weighing. In the newborn nursery, newborns are usually weighed daily, or as determined by local policy. The scale used should be properly balanced; the time of weighing approximately the same for each day; and allowances made for pads, diapers, or clothing which are weighed with the infant.

k. Other Information. Information on infants is also included in chapter 10 in order to provide continuity and prevent undue repetition.

★CHAPTER 8

EMERGENCY MEDICAL CARE

Section I. INTRODUCTION TO VITAL PROCESSES

8-1. Systemic Response to Injury

a. No injury is dynamic. It continues to produce harmful effects on the injured person until either the injury or the person is defeated. As these effects are general as well as local, the response of the human organisms to injury is also both general and local. For this reason, injuries and their effects must be evaluated from the standpoint that the whole person is injured, and not from the view that an otherwise well-off individual is afflicted with a local defect or that only a part of the total system is affected.

b. Since the effects of injury and the body's efforts to defeat them are constantly changing, treatment personnel cannot rely on one observation or one symptom in evaluating the condition of a patient, especially one seriously injured. Repeated observations must be made and indications of the patient's circulatory condition, temperature, respiration, color and vitality must all be considered to obtain as clear a picture as possible of the patient's condition and the treatment required at the moment the particular observation is made.

c. Emergency treatment must be fast. Table 8-1 lists where treatment for particular emergencies may be found in this manual.

Table 8-1. Locating Emergency Treatment Measures

Emergency	Go to paragraph
Breathing failure, symptoms	8-4*b*
Artificial respiration	8-5
Expired air technique	8-5*c*
Modified Silvester method	8-5*c*
Pharyngeal airway	8-5*c*
Mask-to-mouth	8-5*c*
Emergency surgical airway	8-6*c*
Burns	8-30—8-35
Extensive	8-34*c*
Minimal	8-34*a*
Moderate	8-34*b*
Regional	8-34*d*
Cardiac arrest	8-9, 8-10
Dislocation	8-28
Fracture	8-21—8-27
Emergency treatment	8-26
Signs and symptoms	8-25
Hemorrhage (*See also* Wounds)	8-11—8-14
Internal	8-14*b*
External	8-14*a*
Pressure points	8-14*a*(3)
Use of tourniquet	8-14*a*(4), (5)
Poisons	8-49—8-58
(*See also* table 8-4)	
Shock	8-15—8-18
General measures	8-16
Treatment	8-17
Replacement fluids for IV	8-18

Emergency	Go to paragraph
Snakebite	8–58
Sprains	8–29
Wounds (*See also* Hemorrhage)	8–36—8–48
Abdominal	8–48
Emergency medical treatment	8–48
Asepsis	8–19*b*
Chest	8–46
Face and Neck	8–45
Head	8–36—8–41
Pneumothorax	8–47
Emergency medical treatment	8–47
Spinal	8–42—8–44

d. General rules for any medical emergency are listed below:

(1) Follow these rules, as required, in this sequence:

(*a*) Clear the airway and restore breathing.

(*b*) Stop the bleeding.

(*c*) Control shock.

(*d*) Dress and bandage if needed.

(*e*) Prepare for movement (splint fractures; treat for pain).

(2) Make the patient comfortable.

(3) Report any emergency treatment.

8–2. Basic Anatomy and Physiology of the Body

The various systems of the body are covered in chapter 2 and the body's reactions to disease and injury in chapter 3.

Section II. ARTIFICIAL RESPIRATION

8–3. Basic Mechanism and Physiology of Respirations

a. Breathing. Breathing is an automatic mechanism under the control of a respiratory center in the brain. Various forces affect the rate and depth of breathing (chap 2), but the respiratory center is under the influence of the concentration of accumulated carbon dioxide in the blood supplying the center. Breathing is accomplished principally by the action of the diaphragm. When the diaphragm contracts, its domed upper surface flattens out and, as a result, the size of the chest cavity increases. This causes a partial vacuum in the chest cavity, and air is drawn into the lungs. The contraction of the diaphragm is accompanied by the contraction of the intercostal muscles between the ribs, which causes the chest cavity to enlarge from side to side and from front to back and thus expand the lungs. Expiration of air from the lungs is caused by the relaxation of the diaphragm and other muscles of respiration.

b. Gas Exchange. The inspired oxygen enters the bloodstream by way of the alveoli, and carbon dioxide waste leaves the body by the same route. Although the wall separating the air in the alveolus from the blood in the underlying capillaries consists of some four structures, this barrier is microscopically thin and permeable. This anatomical feature, together with an optimum pressure differential between each side of the wall, permits the exchange of oxygen and carbon dioxide.

8–4. Oxygen Deprivation: the Primary Medical Emergency

a. General. The most critical medical emergency is anoxia—literally, lack of oxygen, and physiologically, an amount of oxygen insufficient to carry on vital processes. The human brain can withstand anoxia for *only a few minutes* before incurring permanent damage. The heart and other tissues having a high oxygen requirement can withstand anoxia a few minutes longer without damage. The effects of hypoxia—oxygen available in amounts less than the tissue requirement—will be in proportion to the duration and amount of deprivation. Oxygen deprivation occurs under one or more of three general conditions—

(1) When the atmosphere, or inspired air, contains inadequate oxygen or when impurities inhibit the body tissues from carrying or using

the available oxygen. Examples are high altitude, as in mountain climbing or traveling in an unpressurized airplane, and poisonous chemical agents that are inhaled, such as carbon monoxide. Carbon monoxide is a colorless, odorless gas produced by incomplete burning of hydrocarbons such as gasoline, kerosene, oil, coal, wood, or cotton. This gas is a hazard at all times and is likely to be an even greater hazard following occurrence of disaster. In addition to the symptoms of oxygen deprivation in *b* below, a cherry-red coloring of the lips and tongue may be observed in persons poisoned by carbon monoxide.

(2) When the respiratory system fails or is so inefficient that insufficient oxygen is inspired. Head wounds (Para 8–36 through 8–48) may include damage to the respiratory center of the brain so that respiratory movement is disrupted or halted; the lungs may collapse as a result of chest wounds. Morphine, codeine, and barbiturates may depress the respiratory center so that respiration slows or ceases, or electric shock may paralyze it. Spasm of the chest muscles may result from blast or other compression.

(3) When the cardiovascular system fails to distribute the oxygen because of insufficient circulating volume, insufficient number of red blood cells, or heart failure. Regional hypoxia occurs when vessels serving the region are occluded by clot or tourniquet, or are compressed for an extended period by weight of the body or tight bandages. Reduced blood volume results from hemorrhage, dehydration, shifts in electrolyte balance, or shifts in volume. Depression of heart action by such forces as oxygen starvation, electrolyte imbalance, electric shock, blows or pressure against the chest, brain injury, drug depression, and emotional upset reduces the overall circulating volume and the number of blood cells passing any given point in the circulatory system and contributes to general oxygen deprivation. If the heart fails, the circulation stops, and tissue anoxia soon is absolute.

b. Symptoms of Oxygen Deprivation.

(1) *Hypoxia.* Symptoms of hypoxia may include any or all of the following: gasping for breath; marked lack of rhythm in breathing; gurgling, croaking, or rattling sounds in the respiratory apparatus; or a bluish tinge (cyanosis) of the skin, lips, tongue, and fingernails.

(2) *Anoxia.* The patient is at the point of death. There may be either a marked struggle to breathe or no respiratory movement. The cyanosis gives way to a deathly gray, sometimes mottled or splotchy. Depending on the nature of the underlying cause, the patient may be active or comatose.

8–5. Methods of Artificial Respiration

a. Need for Artificial Respiration. If the patient is not breathing, he requires artificial respiration immediately. If he has no heartbeat, he requires immediate heart massage. If there is both respiratory and cardiac failure, resuscitative measures must be applied to correct both conditions. One person should perform artificial respiration; the other, cardiac massage. If one person is working alone, he must perform both measures alternately.

b. Preliminary Considerations. Speed is important. Seconds count. The sooner artificial respiration is begun, the more likely it is to succeed. If a brief glance at the patient fails to detect respiratory movements, you may test for signs of breathing by placing one ear over the patient's nose or open mouth to detect expired air. This test must not take more than a few seconds, and no more time should be spent under the guise of "making sure" the patient is not breathing. Beginning artificial respiration when a patient is breathing will do no harm. *When in doubt, start artificial respiration.*

c. Choice of Method. Some method based on the expired air technique should be used when possible. If the atmosphere contains casualty-producing chemical or biological agents, use the mask-to-mouth method or the modified Silvester method. This would also be used if manipulation of the patient's head or face would cause hemorrhage of or into the airway.

EXPIRED AIR TECHNIQUE OF ARTIFICIAL RESPIRATION

Artificial respiration may be given by inflating the patient's lungs with your breath. The inflation is accomplished via mouth-to-mouth or mouth-to-nose. Mouth-to-mouth is the preferred method; however, when the patient's jaws are tightly closed by spasm or when he has a jaw or mouth wound, the mouth-to-nose method may be used. The procedure in the expired air technique, using either the mouth-to-mouth or mouth-to-nose approach is as follows:

1. Position patient on his back.
2. Clear upper airway. Turn patient's head to one side and quickly clear his mouth of any vomitus, mucus, or debris by running your fingers behind his lower teeth and over the

back of his tongue. Remove any full or partial dental plate. This cleaning process should not take more than a second or two.

3. Position head. Turn the patient's head to the face-up position. If a rolled blanket or some other similar object is immdeiately available, place it under his shoulders so that his neck will be extended and his chin pointing upward. In any event, tilt his head back so that the neck is stretched and the head is in a chin-up position (fig 8–1).
4. Adjust the patient's lower jaw to a jutting-out position by either method shown in figure 8–2, but preferably the thumb-jaw lift. This positioning moves the base of the tongue away from the back of the throat, thus clearing or enlarging the air passage to the lungs. Do not attempt to hold or depress the tongue.
5. Seal the airway opening (nose or mouth) that is not to be used, continuing to hold the patient's jaw forward. The seal must be secure to prevent leakage of air during inflation. If the patient is an infant or small child, cover both his nose and mouth with your mouth, sealing your lips against the skin of his face.

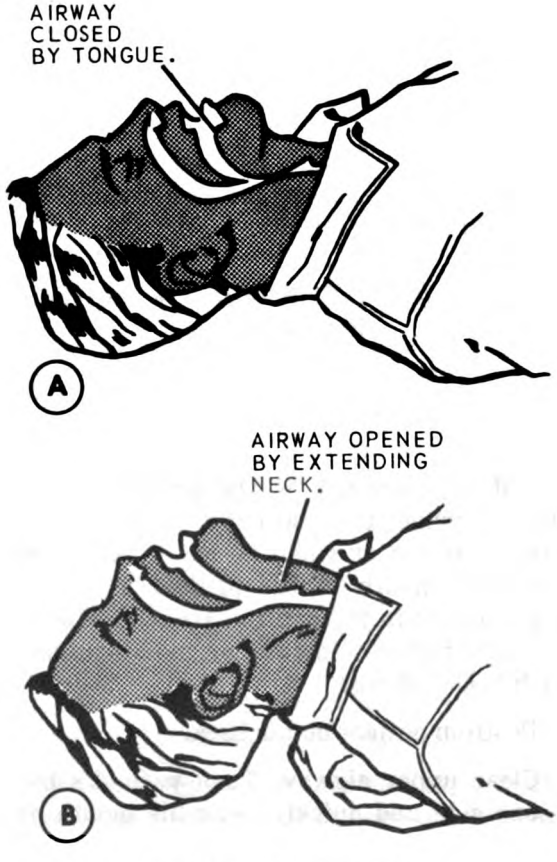


Figure 8–1. Chin-up position.

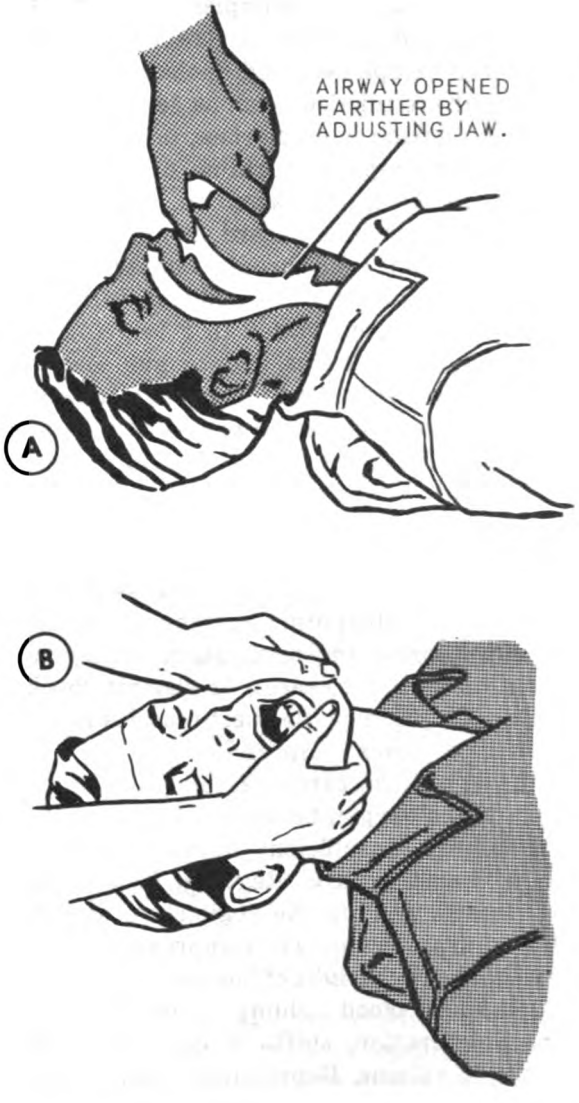


Figure 8–2. Two methods for adjusting lower jaw to jutting-out position. (A) Thumb jaw-lift; (B) Two-hand jaw lift.

The nose. Seal the nose by pinching it shut with your free hand (fig. 8–3(A)) or by, pressing your cheek firmly against it (fig. 8–3(B)).

The mouth. Seal the mouth by placing two fingers lengthwise firmly over the patient's lips.

6. Take a deep breath, open your mouth wide.
7. With your eyes focused on the patient's chest, blow forcefully into his airway (mouth or nose) unless he is an infant or small child (see Note below). If the patient's chest rises, it shows that the air is reaching his lungs, so continue the procedure (8 and 9 below). If the chest does not rise, take corrective action. First, hold the jaw up more forcefully and blow harder, making sure that air is not leak-

Figure 8–3. Expired Air Technique of artificial respiration; (A) Nose sealed thumb and finger; (B) Nose sealed with cheek.

ing from the mouth or nose. If the chest still does not rise, recheck the mouth for foreign matter and, if necessary, turn the patient on his side and strike him between the shoulders with considerable force repeatedly as necessary to dislodge obstruction in the air passage. Then inflate his lungs.

8. Remove your mouth from the patient's airway and listen for return of air from his lungs. If the patient's exhalation is noisy, elevate his jaw further.
9. After each exhalation of air from the patient's lungs, blow another deep breath into his airway. Make the first 5 to 10 breaths deep (except for infants and small children) and give them at a rapid rate in order to provide fast reoxygenation. Thereafter, give the breaths at a rate of 12 to 20 times per minute until the patient is able to breathe with less assistance or until he is declared dead by the most competent medical authority available. A smooth rhythm is desired but split-second timing is not essential. As the patient attempts to breathe, adjust the timing of your efforts to assist him.

NOTE

For infants or small children, blow small

puffs of air from your cheeks, rather than deep breaths from your lungs.

- If your breathing at the start has been very deep and rapid, you may become faint, tingle, or even lose consciousness if you persist. But if, after administering the first 5 to 10 deep, rapid breaths, you adjust your breathing to a rate of 12 to 20 times a minute with only moderate increase in normal volume, you probably will be able to continue to give rescue breathing for a long period without these temporary ill effects. If you become distressed from giving shallow breaths to an infant or small child, interrupt your rhythm occasionally to take a deep breath.
- After a period of resuscitation, the patient's abdomen may bulge. This indicates that some of the air is going into his stomach. Since inflation of the stomach makes it more difficult to inflate the lungs, apply gentle pressure to the abdomen with your hand between inflations.

10. Treat to prevent or lessen shock as soon as the patient is breathing satisfactorily for himself.

USE OF THE PHARYNGEAL AIRWAY

1. The pharyngeal airway is a tube-like device with a mouthpiece for the rescuer, a breathing tube for the patient, and a flange to seal the patient's lips. The use of this airway makes it possible to administer mouth-to-mouth (mouth-to-airway) resuscitation without direct contact between the mouths of the respirating person and the patient. The airway also hold the tongue forward, eliminating the need to place the jaw in a jutting-out position. It does not prevent obstruction, however, unless the patient's head and neck are extended as in step 3 of expired air technique. When this airway is used, the patient's nostrils must be pinched to prevent leakage of air during inflation of his lungs.
2. The pharyngeal airway is inserted after the patient's mouth has first been cleared of any foreign matter. The tongue is held forward; then the airway is inserted into the mouth so that it rests behind the tongue. Insertion is sometimes difficult and should be attempted only by experienced personnel. Attempts by inexperienced personnel not only delay the start of artificial respiration, but also may result in injury to the patient's pharynx. The risk to the patient is unnecessary, especially when all that is being accomplished is the avoidance of what might be distasteful contact with the mouth of a patient near death. If a person experienced in airway insertion is immediately available, that person may insert the airway and a novice may then use it to give artificial respiration. The pharyngeal airway is not to be used if the patient cannot tolerate it without gagging, coughing, or vomiting.

MODIFIED SILVESTER METHOD

1. Position patient on his back.
2. Clear upper airway (as in step 2 of expired air technique). If the patient is wearing a protective mask (fig. 8–4), quickly lift the mask, clear the upper airway and the mask with your fingers, and replace the mask. Maintain a clear air passage by repeating this procedure later, if necessary. If the patient is not masked and the atmosphere is toxic, put his mask on him.
3. Position head (as in step 3 of expired air technique).
4. Position yourself. Stand at the patient's head and face his feet. Kneel at his head on one knee; place your opposite foot to the other side of his head and against his shoulder to steady it (fig. 8–4). If you become uncomfortable after a period of time, quickly switch to the other knee.
5. Grasp the patient's hands; place them over his lower ribs (fig. 8–4Ⓐ).
6. Rock forward and exert steady, uniform pressure almost directly downward (fig. 8–4Ⓑ) until you meet firm resistance. This pressure forces air out of the lungs.
7. Move his arms slowly outward from his body; then, keeping his arms straight, lift them vertically, past his head (fig. 8–4Ⓒ); now stretch them backward as far as possible (fig. 8–4Ⓓ). This process of lifting and stretching the arms increases the size of the chest and draws air into the lungs.
8. Replace his hands on his chest and repeat the cycle: (1) press, (2) lift, (3) stretch, (4) replace. Give 10 to 12 cycles per minute at a steady, uniform rate. Give longer counts of equal length to the first three steps, making the fourth or "replace" period as short as possible.
9. Continue artificial respiration until the patient can breathe without assistance or until he is declared dead by the most competent medical authority available. As the patient attempts to breathe, adjust the timing of your efforts so as to assist him.

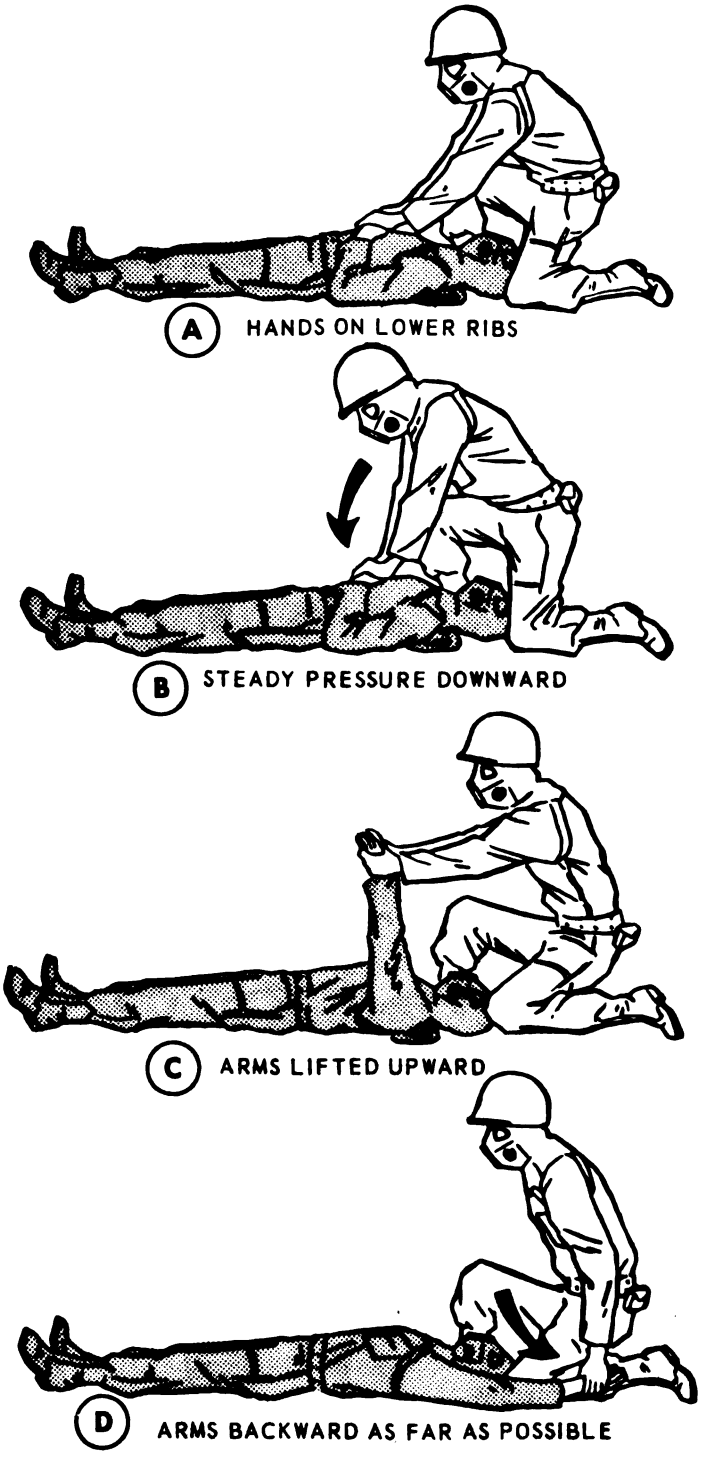


Figure 8-4. Modified Silvester method of artificial respiration.

10. If a second person is available, have him relieve you with practically no break in the rhythm. Continuing to administer artificial respiration, move to one side while the replacement takes his position from the other side. During the "stretch" step, the replacement grasps the patient's wrists and continues artificial respiration in the same rhythm, shifting his grip to the patient's hands during the "replace" step.
11. Treat to prevent or lessen shock.

MASK-TO-MOUTH METHOD

The mask-to-mouth method or the modified Silvester method of artificial respir-

ation is used in a contaminated atmosphere. By using the M17A1 Field Protective Mask (fig. 8–5Ⓐ) and the M1 Resuscitation Tube (fig. 8–5Ⓒ), uncontaminated air can be put into the patient's lungs.

PREPARATION OF YOUR MASK

1. Turn the valve handle (fig. 8–5Ⓑ) to the left, thus positoning the breathing tube bitepiece (inside the mask) between your teeth to hold it. The bitepiece will spring back to the neutral position if you release your bite.
2. Using your left hand, raise the voicemitter cover (fig. 8–5Ⓐ); then with your right hand insert the outlet valve of the resuscitation tube (fig. 8–5Ⓒ) into the air outlet well which is under the voicemitter cover. To obtain a tight, leakproof seal, first insert the unflanged edge of the air outlet valve (fig.

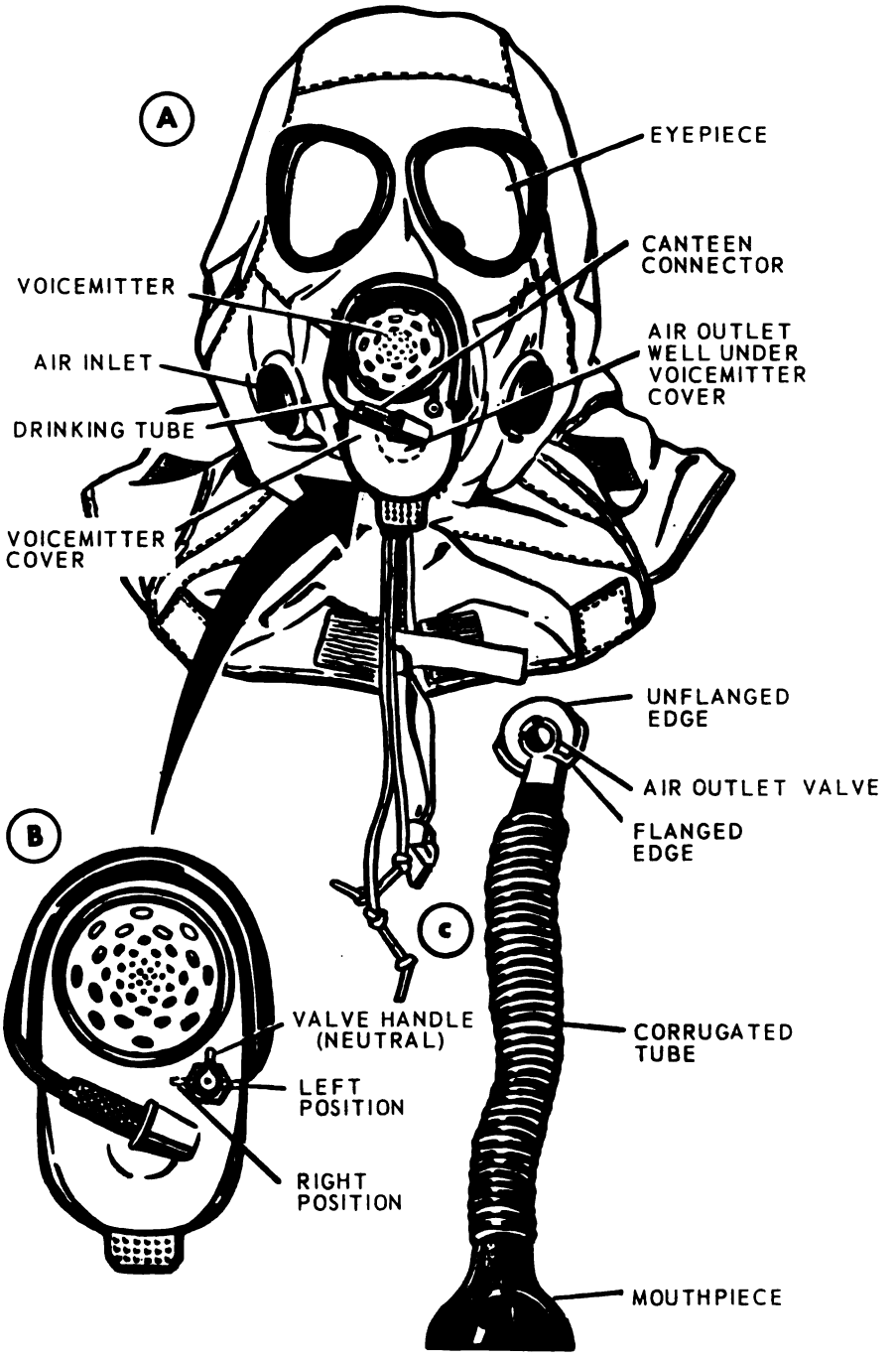


Figure 8–5. M17A1 field protective mask and M1 resuscitation tube.

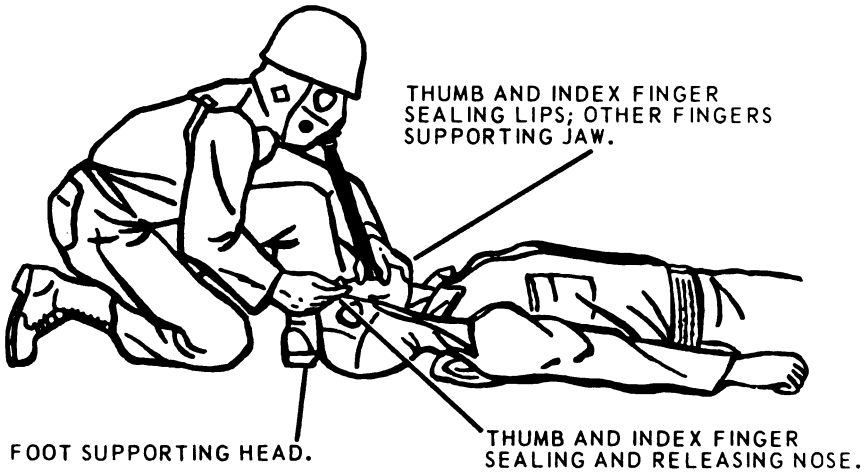


Figure 8–6. Mask-to-mouth artificial respiration.

8–5©) with an upward push, and then press the flanged edge inward as hard as possible.

3. To check whether or not a leakproof seal has been obtained, fold back and pinch the lower end of the corrugated tube (fig. 8–5©) and blow into your breathing tube bitepiece. If the corrugated tube does not tend to expand, remove and reinsert the outlet valve as in 2 above and then check again.

PREPARATION OF THE PATIENT

1. Raise the patient's protective mask only enough to expose his mouth and nose; then clear his airway. Turn his head to one side and quickly clear his mouth of any vomitus, mucus, or debris by running your fingers behind his lower teeth and over the back of his tongue. Remove any full or partial dental plates. Clear mask, if needed, and replace.
2. Position him on his back, his head in a chin-up position (fig. 8–1) and his jaw in a jutting-out position (fig. 8–2).
3. Insert the mouthpiece of the resuscitation tube (fig. 8–5©) between his lips and teeth (fig. 8–6). Slide only one-half of it into his mouth at a time. Insert the indented portion of the mouthpiece under the upper lip. Insure that the edges of the mouthpiece are completely sealed with his lips.
4. Secure the mouthpiece in place by forming a seal over his lips with your thumb and index finger. Hook the other three fingers under his chin to keep his jaw in a jutting-out position.

ARTIFICIAL RESPIRATION

1. With your free hand, pinch the patient's nose closed, take a deep breath, and blow into your breathing tube bitepiece. Be sure your first five breaths are deep and fast to provide for rapid reoxygenation of blood. After this, blow at the rate of 12 to 20 per minute.
2. Continue blowing while watching for his chest to rise. If it does not, hold his chin up more forcefully and blow harder. If his chest still does not rise, check all connections for leakage of air.
3. When his chest rises, stop blowing and release his nose, letting him exhale. As soon as he exhales, close his nose again.
4. Continue blowing and allowing him to exhale. If his exhalation is noisy, hold his chin up more forcefully or check for the presence of secretions in his upper airway.
5. When he begins to breathe on his own, adjust your breathing to assist him. Blow only when he is inhaling.
6. When he breathes regularly, stop blowing air into his lungs but leave the resuscitation tube in place, thus allowing him to inhale uncontaminated air through your mask. Be sure to close his nose when he inhales and open it when he exhales. If he does not continue to breathe regularly, resume mask-to-mouth resuscitation.

TERMINATION OF ARTIFICIAL RESPIRATION

1. When the patient can breathe without assistance, remove the resuscitation tube from his mask and quickly replace the mask. Be sure it is properly sealed. Continue to observe him to insure that he does not stop breathing again

as the result of toxic vapor that may have accumulated in his mask.

2. Readjust your mask:
   a. Release the breathing tube bitepiece, thus allowing it to spring back to its neutral position (fig. 8–5Ⓑ).
   b. Disconnect the resuscitation tube from your mask by pulling it outward and upward, and replace the voicemitter cover.
   c. Wipe the mouthpiece of the resuscitation tube clean and stow in the carrier.

Section III. EMERGENCY SURGICAL AIRWAY

8–6. Emergency Cricothyroidotomy

a. Most airway difficulties are relieved by nonsurgical measures, such as expired air technique of artificial respiration. Persistent obstruction during such measures requires an emergency surgical airway for relief. In such cases the procedure of choice for the specialist without surgical skill is cricothyroidotomy. Before attempting this operation, however, a specialist should have had prior training and have tried conservative measures first.

b. A cricothyroidotomy is an incision made through the skin and cricothyroid membrane covering the cricothyroid space to provide an emergency airway into the larynx. This cricothyroid space is located between the cricoid and thyroid cartilages (fig. 2–24). It is shaped somewhat like the lower lip and measures about 2 cm. at the widest part vertically. The membrane covering the space is thin but relatively tough.

c. The patient in the early stages of complete respiratory obstruction, or with partial but progressive obstruction, struggles for breath. There is straining of neck and chest muscles and other evidence of a frantic effort to regain ventilation. There may be wheezing or crowing noises. The facial features may be livid red, blue, or nearly white. If the obstruction is not relieved, respiratory weakness and failure follow as the brain centers become affected by anoxia. The specialist should consider a cricothyroidotomy necessary when airway obstruction persists after artificial respiration by the expired air technique fails to inflate the lungs. The need for a cricothyroidotomy can, therefore, be determined within seconds, and if the patient's life is to be saved, the operation must be performed immediately by the personnel present and with the equipment at hand.

EQUIPMENT

1. *Cutting instrument.* Since an emergency airway only requires cutting through skin less than one centimeter in depth and perforation of a thin membrane, any sharp instrument that is immediately available, whether it be surgical knife, scissors, razor blade, pen knife, broken glass, sharp piece of tin, or safety pin may be used.
2. *Tube or spreader.* Almost any type of tube or small instrument may be used to keep the surgical airway open so that air can pass through. In many instances, however, the surgical opening stays open without aid; therefore, the operation is not delayed while tubing is sought. If a standard tracheotomy cannula is available, it is used; otherwise, rubber or plastic tubing, fountain pen barrel, fingernail clippers, or some such item may be used.

PROCEDURE FOR EMERGENCY CRICOTHYROIDOTOMY

1. Get cutting instrument and, if immediately obtainable, tubing or spreading instrument.
2. Put patient in the chin-up position (fig. 8–1).
3. First locate the thyroid and cricoid cartilages. These cartilages are situated in the midline at the midpoint of the neck. At the top of the thyroid cartilage is a V-shaped notch close to the top of the neck. In most men, the thyroid cartilage or "Adam's Apple" is easily located. (However, in females and children, the cricoid cartilage may be just as prominent or even more prominent than the thyroid cartilage.) Below this thyroid cartilage is the cricoid cartilage. Just below these two cartilages are the tracheal rings. Identify the thyroid and cricoid cartilages by sliding your finger down the patient's neck. With other than adult male patients, confirm the identification by sliding the finger upward from the tracheal rings.
4. Place the tip of the finger between the thyroid and cricoid cartilages. The transverse (crosswise) depression which can be felt is

the cricothyroid membrane over the cricothyroid space. Lift your finger and mark the spot on the skin visually.

5. Make a 1- to 2-inch transverse incision through the skin over the cricothyroid space. Do not attempt to cut through the membrane when making this skin incision because of the possibility of damaging the cricoid cartilage, thus causing a chronic laryngeal condition which would affect both the voice and breathing. If only a relatively dull cutting instrument is available, pinch up the skin and cut with a (crosswise) sawing action from side to side.
6. Relocate the cricothyroid space. With the skin incised, the membrane over this space is readily seen; however, exposure to direct vision is not essential. If necessary, relocate the space manually by again feeling the thyroid and cricoid cartilages with the finger.
7. Cut or perforate—but do not stab—the cricothyroid membrane. Enlarge the opening by cutting in a horizontal direction, using a lateral withdrawing motion.
8. Insert the tracheotomy cannula or a tube-like item into the cricothyroid space to keep the airway open.
9. If respiratory difficulty continues after the establishment of this surgical airway, apply mouth-to-cannula (tube) breathing. If rescue breathing fails, apply suction to the patient's air passages (para 8–7).
10. Secure the tracheotomy cannula or the tube-like item in place. A rubber or plastic tube and other tube-like item may be anchored with adhesive tape, twine, or cord. Also a large safety pin may be stuck through two sides of a soft tube to prevent it from slipping into the airway.

USE OF THE TRACHEOTOMY CANNULA

The tracheotomy cannula (para 5–110) consists of three parts: an outer cannula with plate to which retaining straps are later fastened; an obturator, which is an olive-tipped, curved rod used to guide the outer cannula into the surgical opening; and an inner cannula, which is inserted into and locked in the outer cannula after the obturator is withdrawn and which may be removed as often as necessary to clear it of mucus and blood. The tracheotomy cannula is inserted as follows:

1. Place the obturator inside the outer cannula with its olive-shaped tip extended beyond the end of the cannula.
2. Insert the outer cannula into the surgical opening, letting the olive-shaped tip guide the cannula into the air passage.
3. Remove the obturator from the outer cannula.
4. Insert the inner cannula into the outer cannula, turning the key to secure it in place.
5. Secure the outer cannula in place with two strips of gauze, tape, or cloth, fastening them to the openings on each side of the plate of the outer cannula and tying the other ends around the patient's neck (fig. 8–7).
   a. In order to fasten the strips to the plate, make a slit about 1 inch from the end of each strip. Insert these ends through the openings on the plate. Thread the loose ends through the slits and draw smoothly and snugly into place.
   b. In tying the loose ends around the patient's neck, use a square knot and tie it at a point where it will not press against the neck.
6. Place a soft sterile gauze square under the plate of the outer cannula to protect the skin from moisture and irritation. This is accomplished by slitting the gauze square from one side toward the center and pulling the gauze gently under the plate and toward the chin.

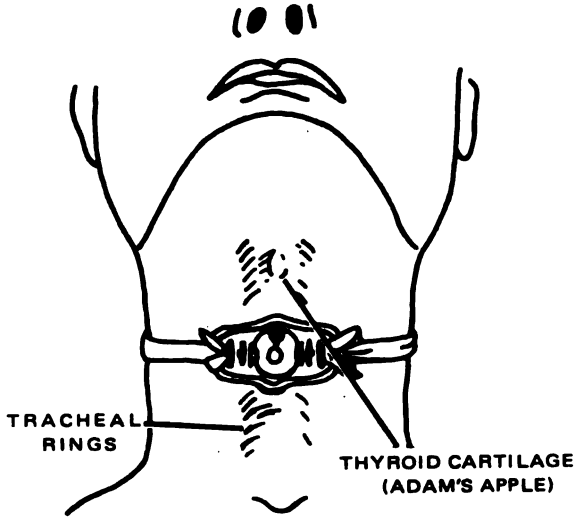


Figure 8–7. Tracheotomy cannula secured at site of cricothyroidotomy.

8–7. Airway Suction

After cricothyroidotomy, suction is applied within the trachea and, if necessary, to one or both bronchi in order to remove by vacuum the fluid, mucus, clotting blood, or vomitus that postural drainage (para 5–70) and coughing do not remove sufficiently to clear the airway. In the emergency medical treatment situation, suction is indicated when any one of the following conditions occur:

a. Symptoms of anoxia are not lessened in intensity immediately after surgical opening of the air passage, and inflation of the patient's lungs cannot be accomplished by prompt mouth-to-tube breathing.

b. The emergency surgical airway is in danger of becoming ineffective due to accumulation of mucus, fluid, and the like. Suction in this instance is done as a preventive measure.

c. The emergency surgical airway has become clogged (as from vomit or sudden release of deep-lying mucous plugs or blood clots). Such clogging may occur, but should not be allowed to occur, from neglect; *for example,* failure to clean the cannula or tube properly (para 8–8) or failure to start preventive suction.

EQUIPMENT

In the absence of equipment designed for the purpose, improvised suction apparatus may be devised. Two components are required: suction tube and vacuum source.

1. *Tubing.* Tubing of sufficient length to reach at least the distance from the patient's surgical airway to past the bronchial attachment is required. Tubing should have an outside diameter small enough to pass easily through the surgical airway or outer tracheotomy cannula if one is attached, and as large an inside diameter as possible. Tubing must be soft, but walls must not be so weak that the tube will collapse when suction is applied. A urinary catheter is suitable for this purpose. Since the catheter holes are near the tip but on the sides, cut the catheter through the center of the upper hole; discard the tip and lower hole. Do not insert infusion set tubing into the trachea; it is much too hard.
2. *Vacuum source.* Vacuum may be created in the tube by attaching a large-capacity hypodermic syringe and pulling back on the plunger, or by taking the free end of the tube in the mouth and sucking. If the syringe is used, it may be necessary to hold the tube tightly over its tip if the inside diameter of the tube is too large to fit.

PROCEDURE

1. Insert one end of the tube through the surgical opening. If a tracheotomy cannula is in place, remove the inner cannula first. Remove or leave in place any improvised tube or spreader as good technique may warrant.
2. Run about 5 inches of the tube into the opening.
3. Draw slight vacuum. If no resistance is felt, carefully push the tube in about 2 more inches and test again. Continue insertion and testing until resistance is felt on drawing the vacuum. During this probing, the point where the bronchi branch may have been reached or passed, and touching of tissue with the end of the tube may have been felt as resistance to further insertion. Do not force the tube. When tissue resistance is felt on the tube, withdraw it slightly, and maneuver it until the foreign substance obstructing the airway is found.
4. When resistance on the vacuum is felt, draw additional vacuum to syphon the fluid or other foreign substance. If resistance is hard, move the tube slightly as the tip may be resting, and the vacuum drawing, against tissue instead of an airway obstruction that will respond to syphoning.
   a. With a syringe as the vacuum source, draw fluid into the syringe; then disconnect syringe, discharge fluid, reconnect syringe, and repeat cycle as necessary until airway is clear.
   b. With the mouth as the vacuum source, draw vacuum and fluids into mouth by inspiration, pinch tube, remove mouth from tube, expel fluids from mouth on exhalation, replace mouth, and repeat cycle until the patient's airway is clear. If the mouth is the best available vacuum source and if syphoning fluids into the mouth cannot be tolerated, two alternatives are suggested for use when time permits.

Alternate 1. Connect sufficient clear used (but clean) tubing between mouth and tubing in the surgical opening so that level of fluid drawn may be seen. Syphon fluid until the level is near the mouth; pinch soft tubing near the level of the

surgical opening breaking the connection between the soft tubing and the clear extension; expel fluid from clear extension by blowing; remake connection; replace mouth; release pinch; and continue suction cycle until patient's airway is clear.

Alternate 2. Draw vacuum on soft tubing in patient's airway to equal volume of a normal inspiration, pinch the tube, withdraw it, release pinch, discharge (blow out) the aspirated contents, wipe and reinsert the tube, and repeat the cycle as necessary to make the patient's airway patent.

5. When the airway is clear, remove the suction tube and make such adjustments at the emergency surgical opening as are necessary.

8–8. Maintenance of a Clear Surgical Airway

Maintenance of a clear surgical airway requires clearing it of the mucus and other fluids which tend to collect after a cricothyroidotomy. These fluids are wiped away from the opening to prevent their aspiration. Improvised tubes are removed periodically, blown and wiped clean, and replaced. Instillation of lint or fuzz in the airway is avoided. The inner cannula of the tracheotomy tube is released, removed, cleaned, replaced, and locked. Bubbles or froth at the opening or noisy breathing when the patient's neck is extended (fig. 8–1) indicate fluid collection. If such signs continue after the opening, tube, or cannula has been cleaned, suction should be done before signs of respiratory distress appear in the patient.

Section IV. CARDIAC MASSAGE

8–9. Cardiac Arrest

a. Causes. Cardiac arrest or heart stoppage may be caused by blockage of critical blood vessels or by insufficient oxygen to the heart or the brain centers which control its functions, as in hemorrhage. Other causes include diseases of the heart, shock, malnutrition, anemia, and the effects of drugs, especially those affecting the regulatory brain centers.

b. Symptoms. In cardiac arrest, there is absence of pulse, heartbeat, and heart sounds. Stoppage is quickly followed by cessation of respiration, if that has not previously occurred, and wide dilation of the pupils of the eyes. The person is unconscious and limp. Since the diagnosis of cardiac arrest must be made with rapidity if the patient is to be resuscitated successfully, the absence of pulse in the carotid artery should be the determining symptom. The pulse of the carotid artery is easily felt with the fingers by tilting the patient's head to a chin-up position (fig. 8–1), placing the heel of the hand over the midline of the patient's trachea, and resting the fingers on his throat parallel to the lower jaw line. If there is doubt, the pulse should be considered absent.

8–10. Principle of Cardiac Massage

a. Cardiac massage that may be performed by specialists consists of a rhythmical compression of the patients heart through the intact chest wall. It is a means of producing circulation artificially, thus keeping blood flowing to the brain and other organs until the heartbeat is reestablished.

b. Within the thorax, lateral motion of the heart is limited by the pericardium, a loose-fitting, fluid-lubricated, membranous sac which surrounds the heart and is fastened to structures comprising the boundaries of the thorax. Accordingly, pressure applied on the sternum pushes the heart against the spine, forcing blood from the heart into the arteries. Relaxation of this pressure allows the heart to fill with venous blood. The thoracic cage is normally resistant to pressure but is surprisingly resilient in cardiac arrest.

c. Cardiac massage must be instituted immediately upon determining the absence of a pulse. Since cardiac arrest is always accompanied by respiratory failure, expired-air artificial respiration must be administered simultaneously or alternately with cardiac massage (fig. 8–8), depending upon whether one or two persons are available to administer these resuscitative measures.

PROCEDURE

1. Prepare the patient for expired air artificial respiration (para 8–5). Be sure that the surface on which the patient is placed is solid. A litter, floor, or the ground is satisfactory; a bed or couch is too flexible unless a board is placed under the mattress.
2. Position yourself. Kneel at a right angle to the patient's chest so that you can use your weight to apply pressure on his sternum. Place the heel of one hand on the lower half of the sternum. Spread and raise your fingers so you can apply pressure without pressing

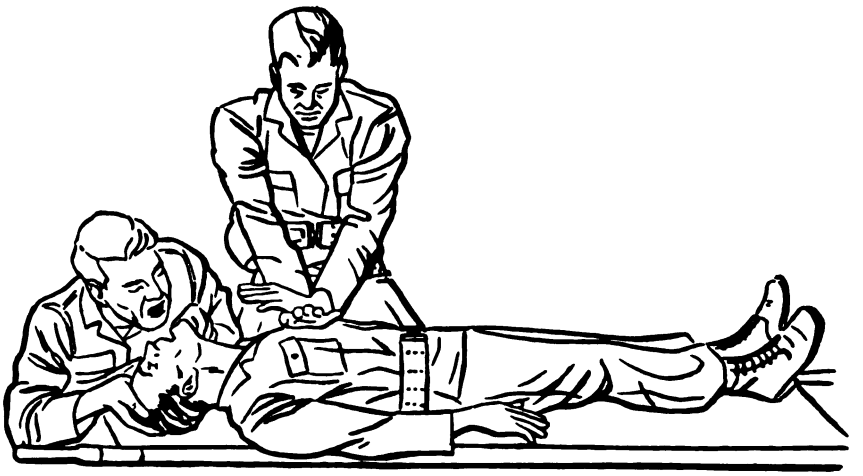


Figure 8–8. Closed-chest heart massage and expired air artificial respiration when two persons are available.

the patient's ribs. Place your other hand on top of the first.

CAUTION

If the patient is a child, omit placing the second hand over the first; if the patient is an infant, place only the fingertips of one hand on the sternum.

3. Apply pressure. Lean forward so that your arms are perpendicular to the patient's sternum and press downward with your hands. Apply enough pressure to depress the sternum 1½ to 2 inches (fig. 8–9). Further depression is likely to fracture the patient's ribs and damage underlying soft structures.

CAUTION

If the patient is a child, apply relatively light pressure with one hand. For infants, especially the newborn, the pressure you can apply with your fingers probably will be more than sufficient to depress the sternum the slight distance necessary to produce blood circulation.

4. Release pressure immediately, lifting the hands slightly.
5. Continue cardiac massage. Repeat the press-release cycle in a cadence of about 60 per minute. After a few minutes, check for a pulse at the carotid artery visually or as in paragraph 8–9*b*. If a pulse cannot be detected, elevate the patient's legs about 6 inches above the level of his head to help the return of blood to his heart. Continue the cardiac massage and the mouth-to-mouth artificial respiration until the patient is able to function without assistance, until you are relieved, or until you are certain that the patient is dead. If performing alone, give one cycle of artificial respiration, then four cycles of cardiac massage. Continuance may involve performing these measures long after you feel bodily discomfort and fatigue. However, stopping these measures must rest on the judgment of the most qualified person available, NOT on the discomfort of the resuscitator.

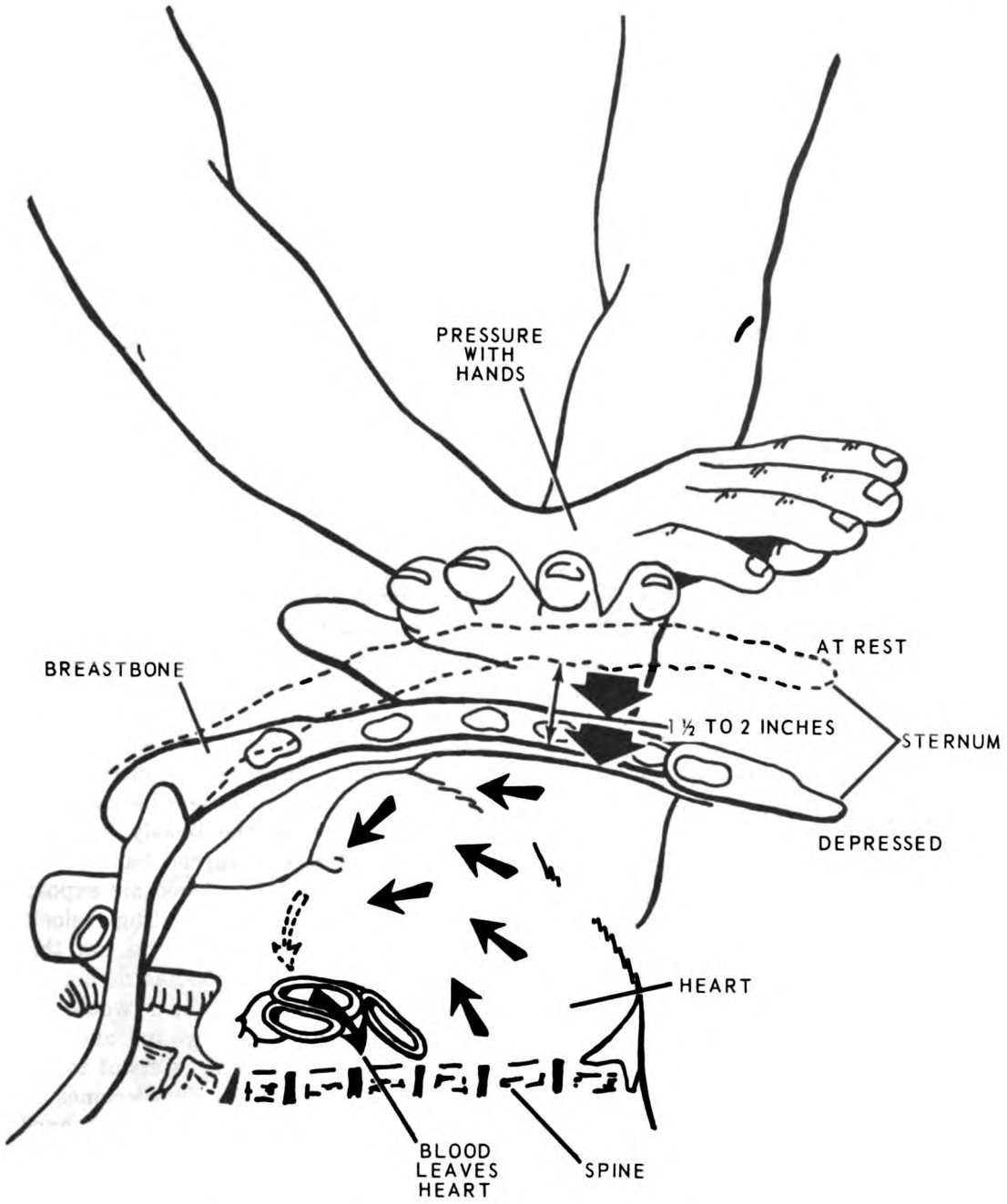


Figure 8–9. Pressure on sternum forces blood out of heart.

Section V. HEMORRHAGE

8–11. Acute Hemorrhage

a. Acute hemorrhage consists of sudden or rapid loss of blood from the circulatory system within a few minutes or hours as a result of an opening or openings in the circulatory system. The body in general and the cardiovascular system in particular react to the stress of any injury to the circulatory system. Shock is apparent after the sudden loss of 15 percent or more of the circulating blood volume. The sudden loss of 50 percent of the circulating blood volume usually resuts in death unless this volume is partially or fully restored. The seriousness of hemorrhage lies in both the rate and the amount of blood volume reduction, which are related to the number, type, and location of the vascular structures opened. If a

vein and an artery of equal size are severed, blood will escape more rapidly from the artery because it is forced out in spurts under the maximum pressure from each heartbeat. Venous hemorrhage, however, can also be fatal if not controlled.

b. Whole blood lost from capillary damage is of negligible importance in amount. Blood loss from capillaries and small veins is referred to here as bleeding.

8–12. Types of Hemorrhage

a. External hemorrhage is loss of blood to the outside of the body and is obvious. The type of blood vessel open may be established by observing the color and flow of the blood issuing from the wound. Arterial blood is bright red (because of its high oxygen content) and escapes in spurts.

b. Internal hemorrhage occurs when there is an opening in the cardiovascular system but none directly to the outside of the body. Swelling and discoloration may be seen in some instances. Swelling and pulsation in an arm or leg may indicate arterial hemorrhage within the affected limb. Internal hemorrhage in a thigh may be detected by measuring and comparing the circumferences of the two thighs. Hemorrhage within the head or lungs may be indicated by bleeding from the nose or mouth, or from the ears in the case of the head. Hemorrhage within the chest or abdominal cavities may be indicated by signs of shock (fig. 5–83).

8–13. Physiologic Reaction

Whenever an artery or vein is opened, the injured vessel constricts and, if severed, retracts into the tissue, thereby reducing the size of the opening and facilitating clot formation. In addition, other blood vessels temporarily constrict as a part of the general reaction to injury. This generalized vasoconstriction helps maintain blood pressure by reducing the size or capacity of the circulatory system. At the site of injury, the blood tends to clot and plug up the opening. If vasoconstriction and blood clotting are unsuccessful, the resulting blood volume reduction causes a fall in blood pressure which, among its other effects, facilitates clot formation. If hemorrhage persists, the person dies from lack of oxygen.

8–14. Methods for Control of Hemorrhage

a. Methods for Control of External Hemorrhage. Control of external hemorrhage is best accomplished if the hemorrhaging wound is first exposed to view. Clothing or other material over the wound should be cut, torn, or lifted away carefully so that additional harm is not inflicted upon the patient. Unnecessary movement, or exposure of the patient to coolness must be avoided; cooling conditions work against the patient by inducing or hastening a lowering of his body temperature.

(1) *Pressure dressing.* Use of the pressure dressing is the method of choice for medical specialists in the control of external hemorrhage in an emergency medical treatment situation. The purpose in applying a sterile dressing with pressure (fig. 8–10) to a hemorrhaging wound is threefold: to facilitate clot formation, to compress the open blood vessel, and to protect the wound from further invasion by infectious organisms.

(*a*) *Assistance in clot formation.* The dressing is of absorbent material which spreads and slows the blood it absorbs. This spreading and slowing action exposes a relatively large and thin surface of the outflowing blood to the air and thereby facilitates clot formation. Accordingly, one dressing partially filled with the patient's blood is more effective in controlling hemorrhage than are a series of others because clot formation is in progress in the bloody dressing. The clot formation tends to spread back toward and into the wound until diminished air exposure, coupled with an adequate circulating velocity (speed), brings it to a halt. It is the clot that stops the hemorrhage. If the blood had no ability to clot, the absorbent dressing applied would merely draw blood out through the wound and do more harm than good. When blood is about to clot, it begins to turn darker in color and becomes progressively darker as the clot takes form. A hard clot is almost black.

(*b*) *Vessel compression.* Direct pressure on a wound usually is very effective in controlling hemorrhage. The pressure is applied for the purpose of minimizing the size of the vessel opening, temporarily or for an extended period, thereby lessening the amount and the velocity of the escaping blood and aiding clot formation. Considerable pressure may be applied to a wound if there is no broken bone in or near it. Hemorrhage does not always stop immediately. At times, hard pressure on the dressing over the wound may be required for several minutes until a clot has formed with sufficient strength to hold with only the help of the dressing ties. (If a clot does not form, a tourniquet must be considered, if feasible.) The

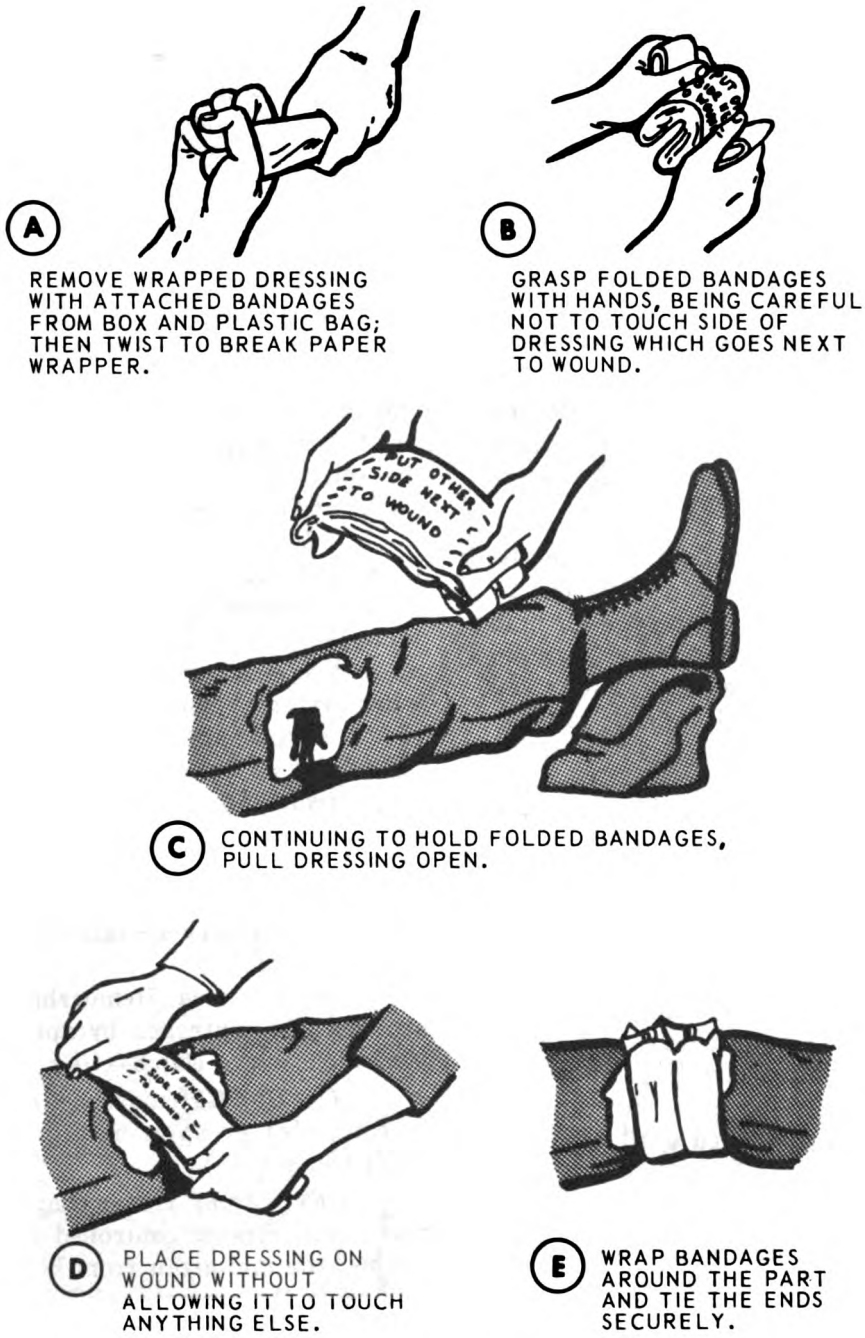

A
REMOVE WRAPPED DRESSING WITH ATTACHED BANDAGES FROM BOX AND PLASTIC BAG; THEN TWIST TO BREAK PAPER WRAPPER.
B
GRASP FOLDED BANDAGES WITH HANDS, BEING CAREFUL NOT TO TOUCH SIDE OF DRESSING WHICH GOES NEXT TO WOUND.
PUT OTHER SIDE NEXT TO WOUND
C
CONTINUING TO HOLD FOLDED BANDAGES, PULL DRESSING OPEN.
D
PLACE DRESSING ON WOUND WITHOUT ALLOWING IT TO TOUCH ANYTHING ELSE.
E
WRAP BANDAGES AROUND THE PART AND TIE THE ENDS SECURELY.

Figure 8–10. Application of pressure dressing.

dressing should be anchored over the wound by the use of attached ties (fig. 8–10) or by using additional bandaging material. The dressing should be anchored snugly to prevent slipping but not tightly. (The wounded part, especially if it is an arm or leg, will swell after a time, tightening the bandage still more and impairing or stopping circulation in the part, to the detriment of the patient.) If signs of renewed hemorrhage from the wound appear after a dressing is snugly in place, reapplication of manual pressure may be all that is necessary to assist formation of a clot of sufficient strength to occlude the vessel. Signs of renewed or continued hemorrhage are appearance or enlargement of a bloodstain on the outer surface of the dressing, and appearance or continuance of blood trickling between the dressing and the skin.

(*c*) *Protection from infectious organisms.* An external wound becomes contaminated with microorganisms at the moment of occurrence. The prompt application of a sterile dressing serves to

limit the entrance of additional organisms which may cause infection. Once a dressing is applied, specialists should leave it in place if at all possible. Removal permits entrance of additional microorganisms and may disturb the blood clot so that hemorrhage begins again. Also, leaving the original dressing in place helps the surgeon viewing it later to estimate the amount of blood the patient has lost. When a wound is being dressed, care must be taken to avoid either touching the wound or the surface of the dressing that is to be placed directly on the wound, breathing onto the dressing or wound, stirring up dust about the patient area, or doing or allowing other actions which would permit infectious organisms to enter the wound.

(2) *Elevation of wounded limb.* Frequently, hemorrhage, especially of the venous type, can be lessened appreciably by raising the wounded limb to a height above that of the heart. (As elevation tends to drain the elevated limb by gravity, an initial gush of blood downward from open veins may be expected when the limb is first elevated.) Elevation helps to lower the blood pressure at the wound site. Elevation may be used before, during, or after application of a pressure dressing, depending mainly on the type and severity of the wound. The patient may be instructed to elevate a nonserious wound while waiting for a dressing and to maintain the height after the dressing is applied. Serious hemorrhage, especially of the arterial type, may require simultaneous and continuous application of elevation, dressing, and pressure. If there is a broken bone in the wounded limb, elevation must be postponed until after the limb is splinted.

(3) *Pressure points.* A pressure point is a place where a main artery supplying the wounded area lies near the skin surface and over a bone. Pressure at these points is applied with the fingers or thumbs (digital pressure) or with the hands. The object of the pressure is to compress the artery against the bone, thus occluding (shutting off) the flow of blood from the heart to the wound. Since it is often difficult to maintain occluding pressure manually on a pressure point, the pressure point method is used only until a pressure dressing can be applied.

(*a*) *Temple or scalp.* Hemorrhage in the region of the temple or from the scalp may be controlled by compressing the main artery to the temple against the underlying skull bone (fig. 8–11Ⓐ) just in front of the ear and above the prominent cheek bone (zygomatic arch).

(*b*) *Lower face.* Hemorrhage of the face below the level of the eyes may be controlled by applying digital pressure to the artery in the notch on the under side of the lower jaw (mandible) (fig. 8–11Ⓑ). This notch is easily located by running a finger from the angle of the jaw forward until the notch is encountered on the under side.

(*c*) *Neck.* Hemorrhage of the neck may be controlled by applying digital pressure below the wound and just in front of the prominent muscle on the side of the neck (sternocleidomastoideus) (fig. 8–11Ⓒ), pressing inward and slightly backward, and compressing the carotid artery against the spinal column. When this pressure point is used, care must be taken not to choke the patient.

(*d*) *Shoulder or upper part of upper arm.* If hemorrhage is from either of these areas, digital pressure is applied behind the collarbone (clavicle) (fig. 8–11Ⓓ). The artery may be compressed against either the clavicle or the underlying first rib; usually pressure against the rib produces less pain in the patient.

(*e*) *Mid-upper arm and elbow.* Hemorrhage from either of these areas may be controlled by applying digital pressure on the inner (body) side of the arm, about halfway between the shoulder and the elbow (fig. 8–11Ⓔ), compressing the artery against the bone of the upper arm (humerus).

(*f*) *Forearm.* Hemorrhage from the lower arm may be controlled by applying digital pressure at the elbow (fig. 8–11Ⓕ).

(*g*) *Hand.* Hemorrhage from the hand may be controlled by applying digital pressure at the wrist (fig 8–11Ⓖ).

(*h*) *Thigh.* Hemorrhage from the thigh may sometimes be controlled by digital pressure against the mid-groin from behind (fig. 8–11Ⓗ), collapsing the artery against the nearby bone of the thigh (femur). At other times, pressure against the inner aspect of the mid-thigh may be more effective. If the mid-thigh pressure point is used, pressure should be applied with the heel of the hand while the hand is closed into a fist and is reinforced by placing the other hand on top (fig. 8–11Ⓘ). Considerable pressure is necessary at this point to collapse the femoral artery against the femur because both lie deeply imbedded in some of the heaviest musculature of the body.

(*i*) *Lower leg.* Hemorrhage from the leg between the knee and the foot may be controlled by firm pressure at the knee. Pressure at one or both sides of the knee may be sufficient. If not, hemorrhage may be controlled by holding the

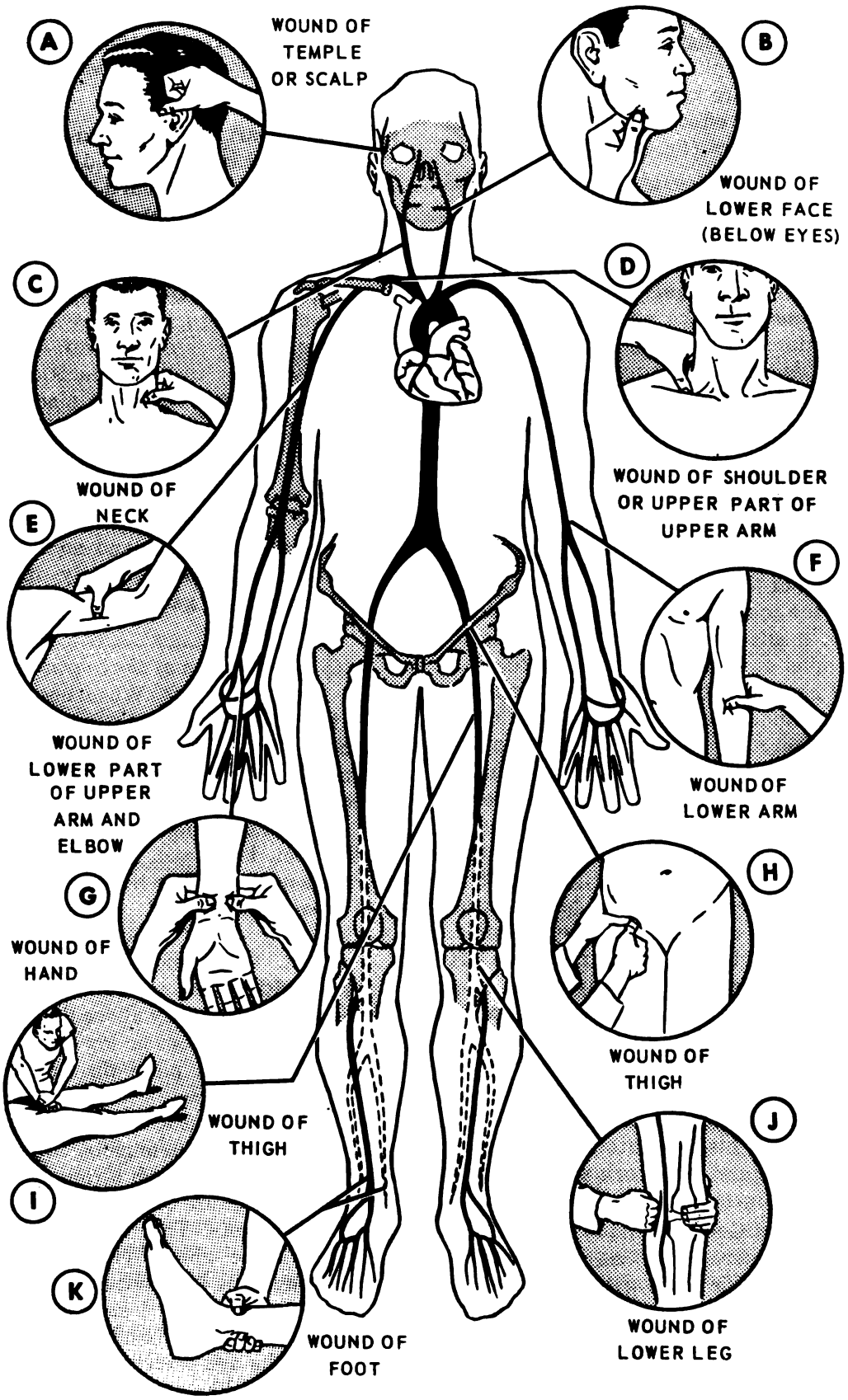


Figure 8–11. Pressure points for temporary control of arterial bleeding.

front of the knee firmly with one hand (fig. 8–11Ⓙ) and thrusting a fist hard against the artery behind the knee (popliteal).

(*j*) *Foot.* Pressure by the hand around and just above the ankle is effective in the control of hemorrhage from the foot (fig. 8–11Ⓚ).

(4) *Use of the tourniquet.* A tourniquet is a constricting band placed around the circumference of one of the extremities (arms and legs). When used in connection with hemorrhage, its purpose is to stop hemorrhage.

(*a*) *Judgment.* In the emergency medical treatment situation, mature judgment is required in making the decision to apply or withhold a tourniquet. Blood flow stops at the tourniquet. Arterial blood flowing outward from the heart stops at the tourniquet. Venous blood flowing inward toward the heart stops at the tourniquet. Without circulating blood which transports life-sustaining oxygen, cells in the limb distal to (outward from) the tourniquet soon begin to die. While later surgical amputation of the limb distal to the point of application of the tourniquet does not necessarily always follow, medical specialists who decide to apply a tourniquet must do so with the realization that the distal portion of the limb probably will be sacrificed. A tourniquet applied to a patient must therefore represent a choice between saving a life and saving a limb—between death by exsanguination (drain of blood) and life minus a limb or a portion thereof. It must not represent a choice between the quick, sure results it produces and the sometimes time-consuming and tiring application of a pressure dressing to control hemorrhage. The decision to apply a tourniquet is irreversible. Once a tourniquet has been applied, it must be left in place until removed by the physician, who should see the patient as soon as possible. It must not be loosened and retightened in the mistaken belief that the portion of the limb distal to the tourniquet is being kept alive. The patient whose system has stabilized after the tourniquet has reduced the capacity of his circulatory system may not be able to withstand the shock of its sudden enlargement if the tourniquet is loosened.

(*b*) *Guideline.* Good technique is the use of pressure points, pressure dressings, and elevation of limbs, where possible; this assures minimum necessity for use of tourniquets. Nonetheless, hemorrhage from a major artery of the thigh, lower leg or upper arm, or the hemorrhage from multiple arteries that is seen in traumatic amputation may prove beyond control by these methods. There is no set rule as to how long one should continue to try to control hemorrhage by pressure dressing and elevation of limb; however, in the emergency medical treatment situation, the absorbent capacity of the soldier's first-aid dressing may be used as a guideline.

- If all or nearly all the blood lost by the patient is contained in the first-aid dressing applied to the hemorrhaging wound, the patient probably has not lost more than 500 ml. of blood at most. This is the amount drawn from a donor who gives blood for transfusion. Thus, if the dressing becomes soaked through with blood but signs of clotting are also present, it is probable that continued pressure, with elevation, if possible, and perhaps with addition of absorbent material to that already in place, will facilitate clot formation and defeat the hemorrhage.
- If the dressing under hard pressure from the hand becomes soaked through, blood spreads rapidly to dry areas of the dressing and possibly drips or runs off, and no indication of clot formation appears promptly on the dressing, there is little to gain from delaying application of a tourniquet.

(5) *Application of the tourniquet.*

(*a*) *Placement.* When needed, the tourniquet is placed around the limb and between the wound and the body trunk, which is to say, between the wound and the heart. It is never placed directly over a wound or fracture.

1. For amputation or partial amputation of the foot, leg, hand, or arm and for bleeding from the upper arm or thigh, place the tourniquet just above the wound or amputation site (fig. 8–12).

2. For hemorrhage from the hand or forearm with no associated amputation, place the tourniquet immediately above the elbow. For hemorrhage from the foot or lower leg with no associated amputation, place the tourniquet immediately above the knee.

(*b*) *Improvisation.* In the absence of specially designated tourniquets, improvised tourniquets may be made from strong, soft, pliable material such as gauze or broadcloth bandage, clothing, or kerchiefs. This material is used with a rigid stick-like object (fig. 8–12). To miniize skin damage, the improvised tourniquet should be made so that it is at least one inch wide *after* tightening. If gauze bandage is used, 3-inch ad 4-inch widths are preferable to the 2-inch width, which is very likely to become less than 1 inch wide after tightening.

(*c*) *Tightening.*

- *Pressure.* The tourniquet is applied with enough

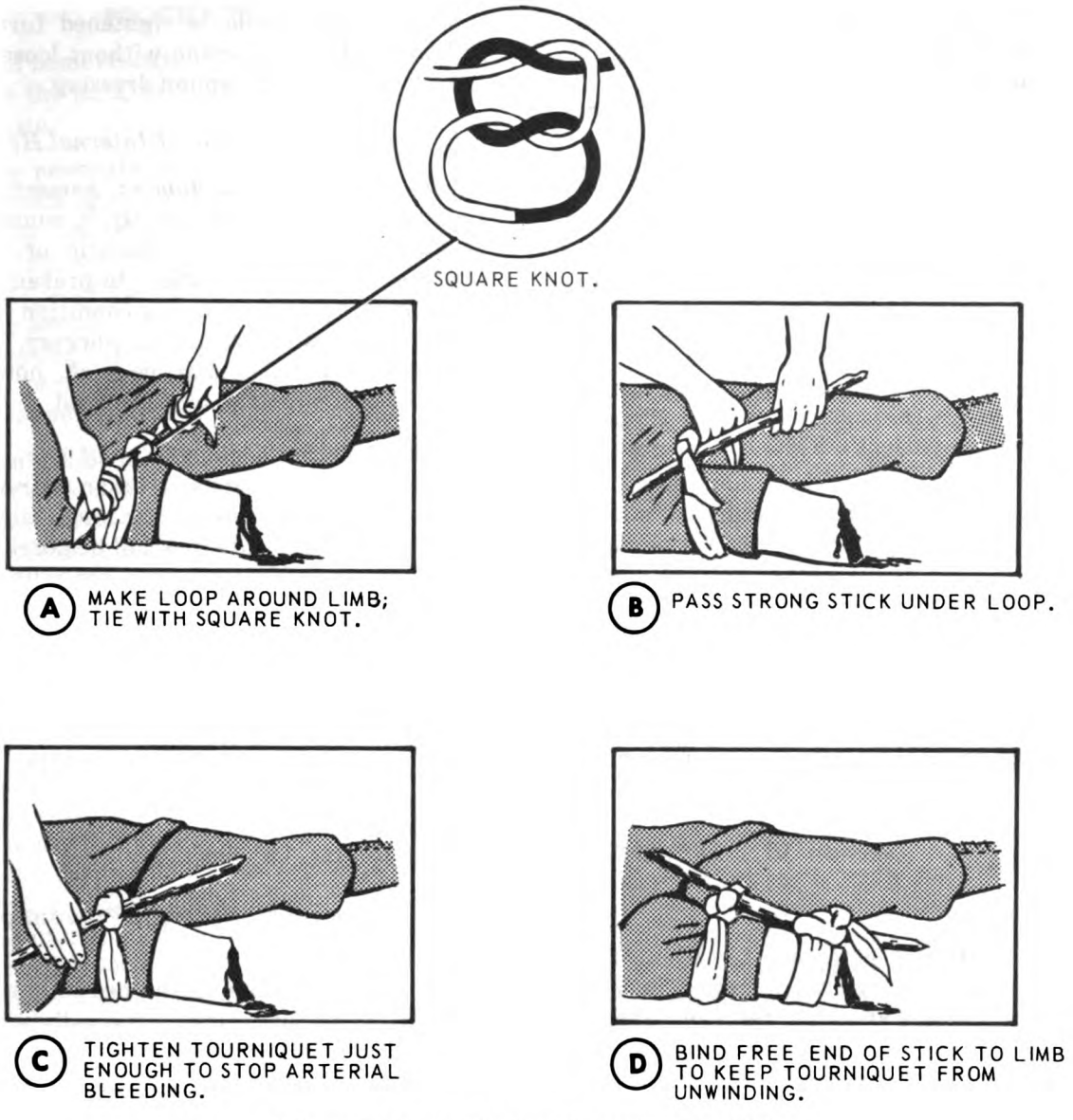

SQUARE KNOT.
A MAKE LOOP AROUND LIMB; TIE WITH SQUARE KNOT.
B PASS STRONG STICK UNDER LOOP.
C TIGHTEN TOURNIQUET JUST ENOUGH TO STOP ARTERIAL BLEEDING.
D BIND FREE END OF STICK TO LIMB TO KEEP TOURNIQUET FROM UNWINDING.

Figure 8–12. Application of tourniquet to thigh.

pressure to stop blood from passing under it. If a pulse has been detectable in the intact wrist or foot of the affected limb, tourniquet pressure is sufficient when the pulse ceases. If a pulse cannot be used as an indicator, you must rely on your judgment of reduction of blood flow from the wound. After a tourniquet is properly tightened, arterial hemorrhage will immediately cease, but bleeding from veins in the distal part of the limb will continue until these vessels are drained of the blood already in them. You should not continue to tighten the tourniquet in an attempt to stop this drainage.

Skin protection. The skin beneath the tourniquet should be protected from pinching, twisting, and tourniquet overtightening. Skin is relatively resistant to oxygen deprivation and may survive even though the limb beneath it may require amputation later. Damaging the skin with the tourniquet may deprive the surgeon of skin required to cover the amputation stump, thus forcing amputation of more of the limb than might otherwise have been necessary. Skin may be protected from pinching and twisting from a tourniquet by placing soft, *smooth* material such as a shirt sleeve or trouser leg around the limb and beneath the tourniquet before tightening. Protection of the skin also reduces the amount of pain inflicted on the patient.

(*d*) *Dressing.* After arterial hemorrhage has ceased and the tourniquet is securely in place, the wound is dressed to protect it from further invasion by microorganisms.

(*e*) *Covering and marking the patient.* The condition of the patient and of the weather may require that the patient be covered. If so, the covering should be so arranged that the tourniquet remains in view. In addition, the presence of a tourniquet should be noted by plainly marking the patient's—

- *Forehead.* If possible, a large letter "T" should be marked on the patient's forehead to indicate that a tourniquet is in place. Also the time the tourniquet was applied should be indicated.
- *Field Medical Card.* The letter "T" and the time and date the tourniquet was applied should be marked on the patient's FMC or its substitute.

(*f*) *Monitoring.* The tourniquet and dressing should be inspected after 15 minutes to assure that arterial hemorrhage has not started again, and every 15 minutes thereafter until absence or stability of the size of any bloodstained area on the outside of the dressing indicates that venous drainage has stopped. Afterwards the tourniquet and dressing should be inspected periodically and adjusted if either has slipped. If at any time it is believed that arterial hemorrhage is continuing, the tourniquet should be tightened further. This judgment should be made without loosening, lifting, or removing the wound dressing.

b. Methods for Control of Internal Hemorrhage.

(1) *Thoracic or abdominal hemorrhage.* Specialists can do nothing directly to control hemorrhage into the patient's thoracic or abdominal cavities. Treating the patient to prevent or lessen shock may help stabilize his condition enough so that he can later withstand surgery. Mortality among such patients may be high, however, despite the best efforts of all concerned.

(2) *Internal hemorrhage of the extremity.* Pulsation and enlargement of an extremity, and sometimes enlargement that cannot otherwise be accounted for, indicate internal hemorrhage. If elevation of the extremity does not relieve the enlargement, a tourniquet may be necessary. If the hemorrhage is in the thigh and swelling is severe, a tourniquet is indicated, because the volume of blood lost from the circulatory system may induce shock and death. This is seldom true of internal hemorrhage in the lower leg or the arm.

Section VI. PREVENTION AND TREATMENT OF SHOCK

8-15. Shock

Shock may be defined as a manifestation of the rebellion of the body against a major insult or injury. It is, in effect, an alarm reaction. Shock is also a defensive mechanism. It may appear suddenly after trauma or develop insidiously. Its predominant characteristic is a reduction in the volume of the circulating blood, accompanied by vasoconstriction, which is followed by vasodilation, hypotension, rapid heartbeat (tachycardia), and prostration. The initial circulatory deficiency is rapidly complicated by widespread oxygen deprivation (hypoxia) and by a lessening of function of all tissues, especially of the brain, liver, heart, and kidneys. Three chief dangers are associated with shock—

a. Early syncope (loss of consciousness), which is mainly neurogenic and which may be fatal.

b. Progressive loss of blood from the active circulation, which may lead to failing heart output and insufficient oxygen to cells that are vital for survival.

c. Sustained hypotension (lowered blood pressure), which may lead to liver and kidney failure.

8-16. General Measures in Prevention of Shock

The ultimate objective in the prevention of shock is to preserve life. The intermediate objective with a wounded patient is to prepare him for surgery. A patient who has not been in shock withstands surgery better than one who has been resuscitated from shock. He must have an adequate supply of oxygen to the brain and to as much other tissue as possible. This objective is met through the control or relief of factors tending to reduce aeration and circulation of an adequate blood volume. Aside from or even in the absence of hemorrhage, circulatory collapse may be hastened or aggravated by a number of factors including fear, fatigue, and pain; dehydration as the result of vomiting, diarrhea, and excessive sweating; movement of the injured parts; sudden shifting of the position; a hot environment; and overdoses of morphine. Therefore, the following preventive measures should be carried out in all cases of impending shock except those in which the specific measure would be against the best interests of the patient.

PROCEDURE

1. Control hemorrhage. Use a pressure dressing, elevate the part, or apply a tourniquet as appropriate.
2. Assure adequate respiration. This may involve nothing more than insuring a free airway by merely observing the patient's breathing, sweeping his mouth with a finger to clear it of foreign matter, or positioning him to assure adequate drainage of any fluid obstructing his air passages. It may also involve performing artificial respiration or surgical operation.
3. Loosen constrictive clothing. Loosen clothing at the neck and waist and at other areas in which it tends to bind the patient. Loosen but do not remove shoes.
4. Reassure the patient. You can do this by reassuring yourself. Remember, if personnel better qualified to give medical treatment were available, you would not be attending the patient. Self-confidence and an attitude of expectancy of success of treatment, along with gentle yet firm actions in giving emergency medical treatment, do much to assure the patient that his best interest is being served. Jokes, ridiculous promises, and unneeded questions are as much out of place as rough handling, indecision, and predictions of impending doom. Acknowledge with a nod of the head and a brief look into his eyes his return to mental clarity, then continue with the treatment at hand. Be receptive and accessible, but initiate conversation only to give instructions or warnings or to take necessary information. Answer the patient's questions as briefly and as straightforward as possible in keeping with the situation. To the question, "Are you a doctor?" the reply, 'I am his assistant," is appropriate. To the question, "Will I be all right?" the answer, "We think so; that is why we are treating you and not someone else," is appropriate.
5. Relieve thirst. Thirst in the conscious patient who is not vomiting and who has no wound of the abdominal cavity or alimentary canal may be relieved by giving him warm stimulants such as coffee, tea, or cocoa to drink unless it is known that within the hour he will undergo general anesthesia for surgery. Water should be started if stimulant ingredients are not available. Do NOT give alcohol; it dilates the blood vessels. Cool salt water or salt-soda water is indicated for patients with serious burns. Encourage but do not force the patient to take liquids by mouth. Never pour fluid into the mouth of an unconscious person. He should take fluids slowly at first and with as little movement as possible. Rapid ingestion, motion, and straining for drinking position may bring on vomiting or collapse.
6. Splint fractures (FM 21-11 and FM 8-35).
7. Relieve pain. Proper dressing, bandaging, splinting, and positioning of the patient are the best measures for relieving pain. In the case of persistent severe pain, morphine may be indicated to prevent shock (para 8-20*b*).
8. Position the patient. When his condition indicates that a recumbent position will best serve his interest, generally either the semiprone position or the head-low position should be used. Other positions are discussed in connection with the special injuries with which they are used (para 8-36 through 8-48). In all instances, small amounts of soft material should be placed beneath the patient so that bony prominences such as those of the cheek, elbow, shoulder, hips, or knees do not press against the litter, ground, or other unyielding support.
   a. Semiprone (coma) position (fig. 8-13) may be used when the patient is unconscious; when there is a wound of the head, face, neck (except fracture) or chest; or when vomiting is likely. When the patient is in this position, drainage from the respiratory tract is helped.
   b. Head-low position (fig. 8-14). The head-low position may be used when the conscious patient has no external injury or has a wound of the limbs. The head-low

Figure 8-13. Semiprone (coma) position.

Figure 8–14. Patient in head-low position with infusion setup in place.

position is not used with patients having conditions discussed in a above nor with patients having fractures of the neck or spine. In the head-low position, the patient is on his back with his feet elevated approximately 6 inches above the level of his head. This position aids the flow of blood back to the heart and to the brain. If no litter or bed is available, the head-low position or its physiologic equivalent may be accomplished by elevating and then supporting the patient's legs with soft or padded material so that his feet are about 6 inches above the level of his head. In addition, padding may be placed under the patient's buttocks to raise them slightly above the level of the head and shoulders. Alternately, the patient may be positioned head low on a slightly inclined slope of the ground.

9. Keep the patient comfortably warm. The patient should not be allowed to become either cooled or overheated.

   a. A drop in skin temperature gives rise to constriction of the superficial blood vessels, thereby reducing the volume of the vascular system. In a cool or cold atmosphere, the patient's body and limbs should be covered with blankets. Wet clothing

should be removed and blanket coverings tucked close to the patient's skin. Sweating should be watched for and differentiated from signs of chilling by taking the patient's temperature.

b. Elevated body temperature places stress on the cardiovascular system. As the superficial vessels dilate in an attempt to cool the blood within them, the system may become too large for the amount of blood it contains. In addition, there is an increased loss of electrolytes, particularly sodium and chloride. In a warm or hot atmosphere, padding used beneath the patient should not be made of wool. The patient should be shaded from the sun. Clothing may be left on and exposed to the atmosphere, provided that a breeze does not evaporate the perspiration in the clothing so rapidly as to chill the patient. He should also be protected against atmospheric temperature changes such as those brought on with nightfall. His temperature should be monitored, and perspiration from heat stress differentiated from signs of chilling.

8–17. Treatment of Patients in Shock

The most important single requirement in the management of shock is to arrest and reverse progressive deterioration by prompt and adequate restoration of the circulatory volume. In fluid volume restoration, an estimate of the volume lost from circulation is needed. In the emergency medical treatment situation, the estimate is based on an estimation of wound size and a judgment of signs and symptoms of shock.

a. Wound Size. Tissue damage in wounds (including burns) can be roughly assessed by using the hand, which has a volume of just under 500 ml., as a standard. The open hand is used to estimate surface wounds and the clenched fist to estimate wounds in depth. Estimates based on this concept are given in table 8–2. The estimate is made as the wound is being dressed, with care being taken that the wound is not further contaminated. The estimate is then marked on the patient's FMC. Table 8–2 should NOT be used in estimating tissue damage from high velocity missiles such as bullets and shell fragments unless the estimator is thoroughly familiar with the characteristics of such wounds. The area of skin damage in such wounds is deceptively small in comparison to the damage concealed beneath the skin.

Table 8–2. Wound Size Estimation.

Volumes of hand*	Size of wound
Less than 1	Small
1 to 3	Moderate
3 to 5	Large
Over 5	Very large

*One hand volume approximately 500 ml.

b. Pattern of Shock. Deleterious effects of injury and the system's reactions to them are continuing processes. Observations of the patient should also be a continuing process, not a single act. The patient may pass through more than one pattern of shock and change abruptly from one condition to another, even though general measures for the prevention of shock may have been successful at the time they were applied (para 5–109 and fig. 5–83.)

8–18. Replacement Fluids for Intravenous Use

In profound shock due to hemorrhage, both the red blood cells and the remaining fluid constituents of the patient's blood require augmentation.

a. Whole Blood. Ideally, it would seem that if blood is lost from the circulation, it should be replaced with blood. On the other hand, there is some evidence to show that an embarrassed circulation responds better at the outset to the introduction of a less viscous fluid such as plasma expander than it does to whole blood. There are also other reasons for not using blood routinely in the management of shock. One is that it is not always readily available in time of war or other disasters. A supply of stored blood introduces a number of complex problems, such as collection, storage, transportation, and maintenance of sterility, to make it not only available but safe. The collection of blood from walking wounded or from local donors, even under relatively peaceful conditions, is practical only on a small scale. Furthermore, the period of safe storage of blood at the present time is less than a month.

b. Serum Albumin. Albumin is a large-molecule protein normally found in human blood. It is extracted and packed in water in 100 ml. vials for infusion. It is highly effective as a blood volume substitute in emergencies, and especially when the patient has lung injury, because it tends to draw

fluid into the vascular system from the surrounding tissues. One vial of albumin has about the same effect on blood volume as 500 ml. of dextran.

c. Normal Saline. Normal saline, physiologic salt solution, and isotonic saline are synonyms that refer to water containing sodium chloride in the same proportion as the body fluids. In practice, the strength of the solution is 0.9 percent. Normal saline is useful for correcting dehydration and replenishing body salt (electrolyte) losses. Since it passes out of the circulatory system very quickly, it is only transiently effective as a volume replacement fluid in shock and ordinarily is not used for that purpose. When oral fluids cannot be given by mouth, about 2,000 ml. or more of normal saline per day by the intravenous route are required to keep the patient's urine output up. This helps prevent kidney failure and uremic poisoning. Only commercially prepared saline solutions are used for infusion fluid.

d. Dextrose (Glucose). Dextrose, often 5 percent in water, is given to correct nutritional and water deficiency when the digestive system route cannt be used. Dextrose is a sweet substance that is usable readily and directly by the body tissue cells. Severely wounded patients may require dextrose in large quantities for several days. Since it passes from the circulatory system quickly, it ordinarily is not used for volume replacement; however, in the emergency medical treatment situation, dextrose, like normal saline, is better than nothing.

e. Ringer's Lactate Solution. Ringer's Lactate Solution closely resembles the electrolyte structure of normal blood serum. It is a fluid and electrolyte replenisher. It is used in almost all cases of dehydration where mild acidosis is present, in supportative treatment of trauma, and in severe diarrhea. The dosage varies with individual requirements, but, in general, 20 to 30 milliliters per kilogram of body weight is administered slowly intravenously or subcutaneously.

f. Administration of Replacement Fluids. Administration by the intravenous route is discussed in paragraph 5–61.

Section VII. ASEPSIS AND PARENTERAL MEDICATIONS

8–19. Asepsis

a. Infection.

(1) *Infectious agents.* Pathogenic (infectious) agents have the capacity to do harm. Pathogenic agents of one kind or another are present in all areas in which life exists naturally. They inhabit the air, soil, and water, also the waste products, respiratory tracts, alimentary tracts, and skins of humans and animals. Those of importance in wound infection are microscopic in size.

(2) *Contaminated wounds.* Anything that harbors pathogenic agents is contaminated. Since pathogens are considered to be universally present in nature, it follows that they enter a wound (except those made under aseptic conditions as in the operating room) immediately when it occurs and the wound is therefore contaminated.

(3) *Infected wounds.* If pathogens, having entered the body, are allowed to multiply or develop, then infection results. If undisturbed for 6 to 8 hours, a contaminated wound shows little change due to contamination. Thereafter, the infectious agents begin to multiply rapidly, invade and destroy tissue beneath the wound, and give off poisonous products or toxins. Within 24 hours after wounding (contamination), local symptoms, including redness, swelling, hardness, heat, pus, and sometimes a foul odor, indicate an infected or septic wound. Fever sometimes accompanies infection.

(4) *Septicemia.* If the infectious process cannot be localized in the wound area by the body's defenses, it spreads eventually into the general circulation, and a generalized septic condition or septicemia, characterized by chills, sweating, and recurring fever, develops which may result in toxic shock and death of the individual. Septicemia is sometimes called blood poisoning.

b. Aseptic Technique.

(1) Aseptic technique consists of those aspects of a procedure which are designed to prevent septic conditions or sepsis. With traumatic wounds, which are assumed to be contaminated beforehand, aseptic technique refers to applying a dressing in a manner so that additional contamination is not induced. In administration of preparations by injection or infusion, it refers to measures designed to prevent or minimize induction of pathogens beneath the skin. In surgery, it normally implies sterile conditions. As for general conditions in and around the patient area, aseptic

technique implies all those procedures that reduce or eliminate pathogens and their actions or minimize their areas of existence.

(2) Aseptic technique is a discipline that consists of a series of events, each of which serves to guard the patient against infection. Some of the steps in the technique may be unfeasible in the emergency treatment situation; however, each of the following essentials can and should be carried out:

(*a*) Sterile items such as dressings that are to be applied to wounds, needles, and instruments to be inserted through the skin, and syringes to be filled for injection into the body must not be allowed to touch anything unsterile before using.

(*b*) Treatment personnel must avoid breathing, coughing, or sneezing on wounds or sterile items.

(*c*) Hands of treatment personnel should be kept clean and as free from contamination as possible under the circumstances.

(*d*) Other specific precautions and safeguards detailed under various techniques are discussed in chapter 5.

c. Sterilization. The complete destruction of microorganisms, to include spores. Surgical instruments, dressings and certain other items are sterile and remain so until individual packages or seals are penetrated and contaminants are admitted. Sterilization normally is accomplished by use of heat, preferably moist. (TM 8–275 covers sterilization procedures in CM.)

d. Disinfection. Disinfection implies the destruction of all pathogenic organisms with the exception of the spore forms of certain bacteria. In the emergency medical treatment situation, the spore-forming organisms of importance are those that cause tetanus and gas gangrene. Tetanus, in the absence of preventive antitetanus inoculation, and gas gangrene are serious infections which threaten wounded patients, especially those with deep, dirty wounds in which the oxygen supply is very limited. In the emergency medical treatment situation, disinfection is often used in lieu of sterilization.

(1) *Boiling.* Under most conditions, boiling water is considered only a sanitizing agent to be used when saturated steam under pressure (autoclave) is not available. When its use is necessary, the effectiveness of boiling water may be increased by the addition of three to four teaspoons of sodium carbonate (washing soda) per quart or liter, and by the use of a tight fitting cover on the boiling container. Articles should be well cleaned before boiling, and then must be totally immersed, with surfaces opened to the solution for thirty minutes of vigorous boiling. Needles; metal cannulas; surgical instruments; glassware, including hypodermic syringers; and similar items may be boiled. Rubber goods may not be boiled. Used dressings should be destroyed, preferably by burning.

(2) *Chemical disinfectants.* Various chemical preparations are effective as disinfectants. Instruments and supplies not adversely affected by them may be disinfected by immersion in a solution of chemical disinfectants for the time specified by the label on the container, by established procedure such as that of a hospital or aid station, or by a person having knowledge of the disinfecting properties of the various chemical solutions. Chemical disinfectants in common use today include Cidex, Wescodyne, isopropyl alcohol 70 percent, and certain phenol preparations specifically designed as disinfecting solutions for inanimate objects. Materials not harmed by water will not be harmed by disinfectant solutions of these chemicals. Articles to be treated must be free of gross dirt and other matter. When disinfection time according to directions is completed, the treated articles must be flushed well with sterile normal saline before being used on the patient. Except for alcohol (isopropyl 70 percent) chemicals of disinfecting strength are not applied to the patient; to assure pathogen kill would also assure damage to the patient's tissue. Use of liquid chemical disinfection should be severely limited to those occasions when saturated steam under pressure (autoclave) is not available or when steam sterilization would damage articles so processed.

e. Use of Antiseptics and Cleaning Agents.

(1) *Antiseptics.* Antiseptics interfere with the growth and development of pathogens without necessarily destroying these agents. Antiseptics are milder than chemical disinfectants, either by nature or by strength, and may be applied directly to patients. Those which may be available in the emergency medical treatment situation include Poridone Iodine, Isopropyl alcohol 70 percent, or a prepared solution of iodine-alcohol mixture. If immediately available, an antiseptic solution may be applied around a superficial wound when hemorrhage is not severe and when surgery, if indicated, is expected to be delayed longer than 6 hours after wounding.

(*a*) When applying antiseptic around a wound, use a sterile cotton swab or sterile gauze

sponge. Start at the wound edge and apply the antiseptic in a direction away from the wound. Do NOT retrace. Start with a fresh swab or sponge for each cleansing sweep of the area. Do not touch the antiseptic supply with the used swab or sponge, or with anything else unsterile.

(*b*) Do NOT put antiseptic into the wound. Do not let antiseptic run or drain into the wound. Do not remove or loosen a dressing for the purpose of applying antiseptic around the area of the wound.

(2) *Cleansing agents.* Cleansing or skin degerming agents, may include soap and water or surgical detergent preparation and water. Mixtures of soaps or skin detergents, with or without antiseptic properties, mechanically bind dirt, grime, and pathogens which are then floated away with rinse water. Since water supply may be severely limited, use of soap or skin detergents may also be limited.

(*a*) Minor cuts and abrasions containing grit or dirt may be scrubbed vigorously with liquid soap (or skin detergent), and water and patted dry with sterile gauze or cotton before dressings are applied. This procedure helps prevent or retard surface infection in patients for whom surgery is not anticipated. Gauze or cotton that has touched the patient or which is otherwise rendered unsterile should not come in contact with the soap supply.

(*b*) General cleanliness of all persons in a disaster area is essential to the preservation of health. Soap and water should be used as often and in such quantities as the state of uncleanliness demands and as the situation permits. Persons giving direct care and treatment to patients should have priority on soaps. Treatment personnel should try to avoid transporting pathogens from one patient to another. Washing hands in soap and water or rinsing hands in antiseptic will help. Hands contaminated with patient blood or other discharges, such as vomitus, mucus, perspiration, urine, and feces, should be thoroughly scrubbed before beginning treatment of the next patient.

8–20. Parenteral Medications

a. General. Parenteral medications are those that are given by some route other than through the alimentary canal. Methods of injection are covered in chapter 5.

b. Morphine Syrettes. A syrette consists of a small, collapsible metal tube fitted with an injection needle and filled with medication (fig. 8–15).

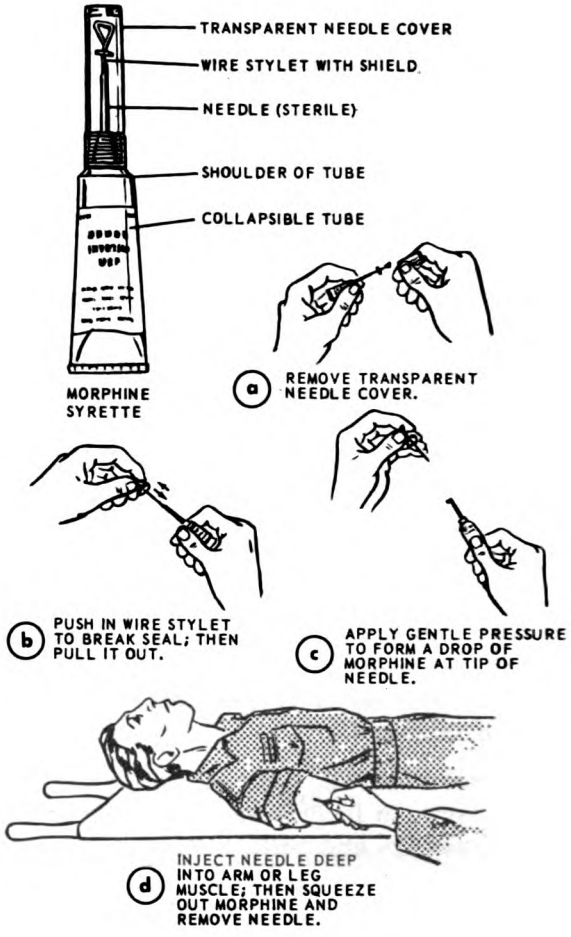

TRANSPARENT NEEDLE COVER
WIRE STYLET WITH SHIELD
NEEDLE (STERILE)
SHOULDER OF TUBE
COLLAPSIBLE TUBE
MORPHINE SYRETTE
(a) REMOVE TRANSPARENT NEEDLE COVER.
(b) PUSH IN WIRE STYLET TO BREAK SEAL; THEN PULL IT OUT.
(c) APPLY GENTLE PRESSURE TO FORM A DROP OF MORPHINE AT TIP OF NEEDLE.
(d) INJECT NEEDLE DEEP INTO ARM OR LEG MUSCLE; THEN SQUEEZE OUT MORPHINE AND REMOVE NEEDLE.

Figure 8–15. Morphine syrette.

It is designed for use in emergency situations when minimum medical supplies are available. Most morphine syrettes contain 16 mg. (one dose) of a morphine salt; however, others may contain different amounts. The morphine in syrettes is for intramuscular injection only; it is never injected directly into the bloodstream. Morphine syrettes may be issued to the combat medical soldier by the battalion aid station.

c. Indications and Contraindications for Use of Morphine. Morphine is a powerful depressor of the central nervous system, having a selective action on respiration and on pain sensation.

(1) *Indications.* In an emergency medical treatment situation, severe pain is the indicator for use of morphine. Pain can precipitate shock or increase its severity. If proper dressing, bandaging, splinting, and positioning fail to relieve severe pain, morphine should be administered at once unless contraindicated ((2) below). In order to avoid making the patient less able to look after

himself, physical pain for which morphine should be administered should be differentiated from fear, anxiety, and hysteria for which morphine ordinarily is not given.

(2) *Contraindications.* Medical specialists should not on their own initiative give morphine to patients when any of the following conditions involve the patient:

(*a*) *Shock.* Morphine should not be used when the patient is in shock unless severe pain is present and is retarding the effect of shock treatment. The attending physician may order intravenous morphine. The intramuscular route is ineffective because of the depressed blood picture.

(*b*) *Chest injury or depressed respiration.* Morphine should not be given to anyone with a chest injury that interferes with respiration or to anyone whose respiratory rate is less than 12 per minute. The drug would increase respiratory depression, perhaps fatally.

(*c*) *Abdominal pain with no visible wound.* Pain is important for diagnosis of its underlying cause. Relief of pain distorts the symptom picture. Morphine should not be given prior to diagnosis of the abdominal condition.

(*d*) *Fractured neck.*

(*e*) *Head injury.* Morphine interferes with diagnosis by distorting the neurological symptom picture.

(*f*) *Unconsciousness.*

(*g*) *Walking wounded.* Morphine would cause some of the walking wounded temporarily to become confused, nauseated, or otherwise less able to fend for themselves. Withholding morphine from these patients is in line with the long-held dictum of military medicine: "Never make a casualty worse off than he already is."

(*h*) *Patient previously injected with morphine.* A dose of morphine should never be repeated within 2 hours. Patients in shock at time of injection or in whom shock has developed later may not absorb the morphine injected intramuscularly. The dose, plus any others, will be absorbed promptly after the circulatory picture is restored; if multiple doses have been given, morphine poisoning will result.

(*i*) *Emotional instability.* Morphine should not be used as a sedative in the treatment of anxiety, fear, or hysteria.

(*j*) *Impending surgery.* If surgery for the patient is imminent, morphine should be withheld unless ordered by a medical officer. Morphine and general anesthesia both act to depress respiration.

d. Administering Morphine by Syrette. Morphine administered by syrette is injected into the muscle of the buttock, upper arm, thigh, or calf of the leg. When preparing to administer morphine, make sure no contraindicating condition exists (*c* above).

(1) *Site preparation.* Select, expose, and cleanse the skin of the injection site with alcohol. If morphine is urgently needed and cleansing materials are not immediately at hand, proceed without cleansing.

(2) *Syrette preparation.*

(*a*) Grasp the tube of the syrette at the shoulder (fig. 8–15) and unscrew and remove the transparent needle cover, taking care to avoid touching or otherwise contaminating the sterile needle.

(*b*) Grasp the loop at the end of the wire stylet and push stylet firmly into the needle to pierce the inner seal of the tube.

(*c*) Pull out and discard the stylet and shield.

(*d*) Holding syrette with needle pointing up, apply gentle pressure on the tube so that a drop of the contents appears at the tip of the needle.

(3) *Injection.*

(*a*) Holding the syrette at the shoulder and in a perpendicular position to the skin, thrust the needle through the skin into the muscle to a depth at least half the length of the needle.

(*b*) Inject the morphine by slowly squeezing the tube from the sealed end toward the needle end until the tube is empty or until 16 mg. have been expressed.

(4) *Needle withdrawal.* Withdraw needle with a quick pull; then, using an alcohol sponge, cover and massage the site.

(5) *Marking and recording.*

(*a*) Attach empty syrette to outer clothing or to bandage fastened to the patient's chest. Insert the needle through the cloth and bend it over to form a hook. Do not attach the syrette to blankets or other materials which may cover but are not worn by or fastened to the patiet.

(*b*) Write the dose (16 mg.), route (IM), date, and time on the patient's Field Medical Card or its equivalent.

Section VIII. FRACTURES, DISLOCATIONS, AND SPRAINS

8-21. Injuries to the Skeleton

Bones, being essentially nonyielding structures, are damaged when excessive force is applied to them. The nature of the damage depends upon the direction of the applied force on the bones and the way in which these bones are attached to other bones. The principal acute skeletal injuries are fractures, dislocations, and sprains.

8-22. Definition of Fracture

A fracture is a break in the continuity of a bone or a separation of a bone into two or more parts. A great amount of soft tissue damage often accompanies this type of injury.

8-23. Kinds of Fractures

Fractures are classified as open and closed. An open fracture is one in which there is a break in the skin that is continuous with the fracture. The bone is either protruding from the wound or exposed through a wound channel such as one produced by a bullet, shell fragment, or other missile. A closed fracture is not complicated by a break in the skin; however, there may be soft tissue damage beneath the intact skin.

8-24. Symptoms of Fracture

A tentative or conclusive diagnosis of fracture may be based on any one of the symptoms below. Additional assistance in diagnosis may be obtained from the patient. A history of falling or of having felt or heard a bone snap may help in the discovery of the more precise evidence listed below.

a. Deformity of the Part. Protrusion of a bone segment through the skin or unnatural depression or flexion indicate fracture.

b. Tenderness Over Site of Injury. Tenderness or pain upon slight pressure on the injured part may indicate a fracture.

c. Swelling and Discoloration. Swelling and discoloration at the site of injury increase with time and may indicate fracture. The swelling is due to the accumulation of tissue fluid and blood. When blood collects near the surface of the skin, a bluish discoloration may be seen.

d. Abnormalities With Movement. Deep, sharp pain upon attempt to move the bone is presumptive evidence of fracture. Grating of bone ends against each other indicate fracture. Movement, however, should NEVER be attempted for purpose of making a diagnosis, as it causes further damage to the surrounding tissues and promotes shock.

8-25. Signs and Symptoms in Regional Fractures

In addition to the general symptoms which may be present, a fracture in a specific region of the skeleton may be accompanied by signs or symptoms peculiar to that region.

a. Fracture of the Skull. There may be bleeding or leakage of spinal fluid from nose, mouth, or ears; difference in size of eye pupils; blackening of tissues under the eyes; changes in pulse and respiration that are not necessarily compatible with the blood picture (table 8-3), and paralysis or twitching of muscles. Head injury should be suspected in persons unconscious in a nonpoisonous atmosphere.

b. Fracture of the Neck or Spinal Column. If the spinal cord is injured, there may be loss of sensation or paralysis below the site of the fracture. There may also be loss of control of bladder and bowel. If the space in which the spinal fluid flows between the spinal cord and the surrounding vertebral column is either compressed or enlarged, severe headache occurs.

c. Fracture of the Jaws. Symptoms may include abnormal closure of teeth, inability to swallow or talk, and bleeding and drooling from the mouth. In cases of fracture of both jaws, especially, the soft tissues may drop back into the throat and strangle the patient.

d. Fracture of the Clavicle. Fractured ends sometimes can be felt under the skin. The involved shoulder may be lower than the other. The patient is unable to raise the involved arm above the shoulder; he usually supports the elbow of the involved side with the opposite hand.

e. Fracture of the Rib. Pain, if present, is felt most sharply on inspiration or coughing. The break sometimes can be felt with the fingers. If the lung is punctured, the patient may cough up bright red, frothy blood.

f. Fracture of the Pelvis. The patient, unable to stand or walk, complains of pain in the pelvic region and, if the bladder or kidney is injured, passes blood in the urine.

8–26. Emergency Treatment of Patients With Fractures

a. The first step is to make a brief but thorough examination of the patient to determine the extent of his injuries. Treatment of any life-endangering condition, such as respiration failure, heart failure, or hemorrhage, takes precedence over that for fracture. The treatment applied directly to the fracture is a part of the prevention or lessening of shock, since pain is lessened and likelihood of further trauma is reduced. In addition, morphine may be required to relieve extreme pain from fracture.

b. In the treatment for fractures, the rule, "splint them where they lie," applies. Open fractures are dressed before splints are applied. Care must be taken to avoid moving the fractured part, as the razor-sharp ends of a fractured bone can cut through blood vessels, nerves, and skin. Such additional damage would, of course, increase the possibility of hemorrhage, shock, loss of limb, and loss of life. If movement of the patient is unavoidable or is essential in treatment, the fractured part must be supported if further damage is to be avoided. Slight adjustment of the fractured part may be necessary to restore circulation, the lack ofwhich is evidenced by absence of pule distal to the fracture.

c. To prevent futher damage, a fractured bone must be immobilized. Immobilizing a fractured limb requires splinting the joint above and the joint below the fracture, as movement of these joints would move the bone segments. If possible, the injured part and hands and feet of involved limbs are splinted in the position of function so that the part will be useful to some degree should stiffening or other loss of motion occur. Traction is applied only when the necessary equipment is available.

d. It is very important that all splints be well padded to protect the skin from injury, loss of circulation, inflammation, and infection. If cotton batting or suitable soft fabric is not available, substitutes (leaves, grass, moss) may be used for padding. Bandages used to secure a splint must not be applied so tightly that they impair circulation or have the effect of a tourniquet. A bluish discoloration of the nailbeds or skin of the af-

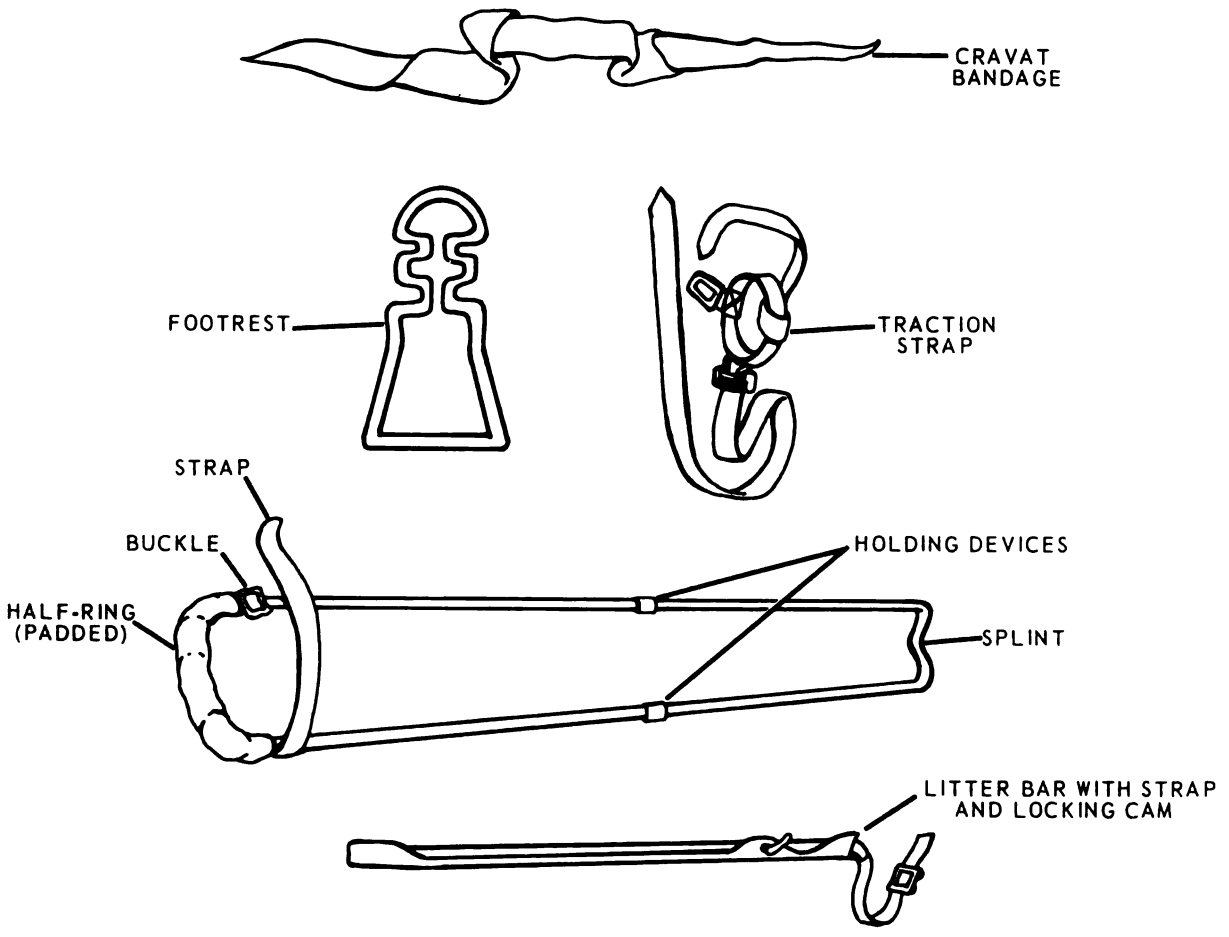


Figure 8–16. Half-ring Thomas splint, telescope type.

fected limb indicates that one or more bandages have been applied too tightly.

WARNING

Bandages should not be tied across a wound.

e. Splints commonly used to immobilize fractures of the extremities are the wire ladder and Thomas leg splint. If this equipment is not available, splints may be improvised, using such items as tree limbs, boards, rolled newspapers, belts, and rifles.

WARNING

Before any weapon is used as a splint, it must first be unloaded.

To immobilize a fractured bone in the thigh or hip, the improvised splint must extend from the groin and the armpit to several inches below the foot. Moreover, the padding should extend over the ends of the splint at the groin and the armpit.

f. Methods of immobilizing, supporting, and transporting persons with fractures are covered in FM 21–11 and FM 8–35.

8–27. Thomas Leg Splint

The half-ring Thomas leg splint with supporting equipment (fig. 8–16) is used to apply traction and immobilize fractures of the lower extremities, making it possible to transport the patient a considerable distance under primitive conditions without further damage. Application of the Thomas leg splint requires the coordinated efforts of three people working as a splinting team. Open fractures are dressed before the splint is applied. Traction is applied to overcome the effect of contraction of the large muscles of the lower extremity. This contraction forces broken ends of bone out of alinement or against each other, which generates pain and the possibility of further damage. Traction, properly applied, overcomes this pressure (fig. 8–17). Traction is not applied when part of the limb is amputated.

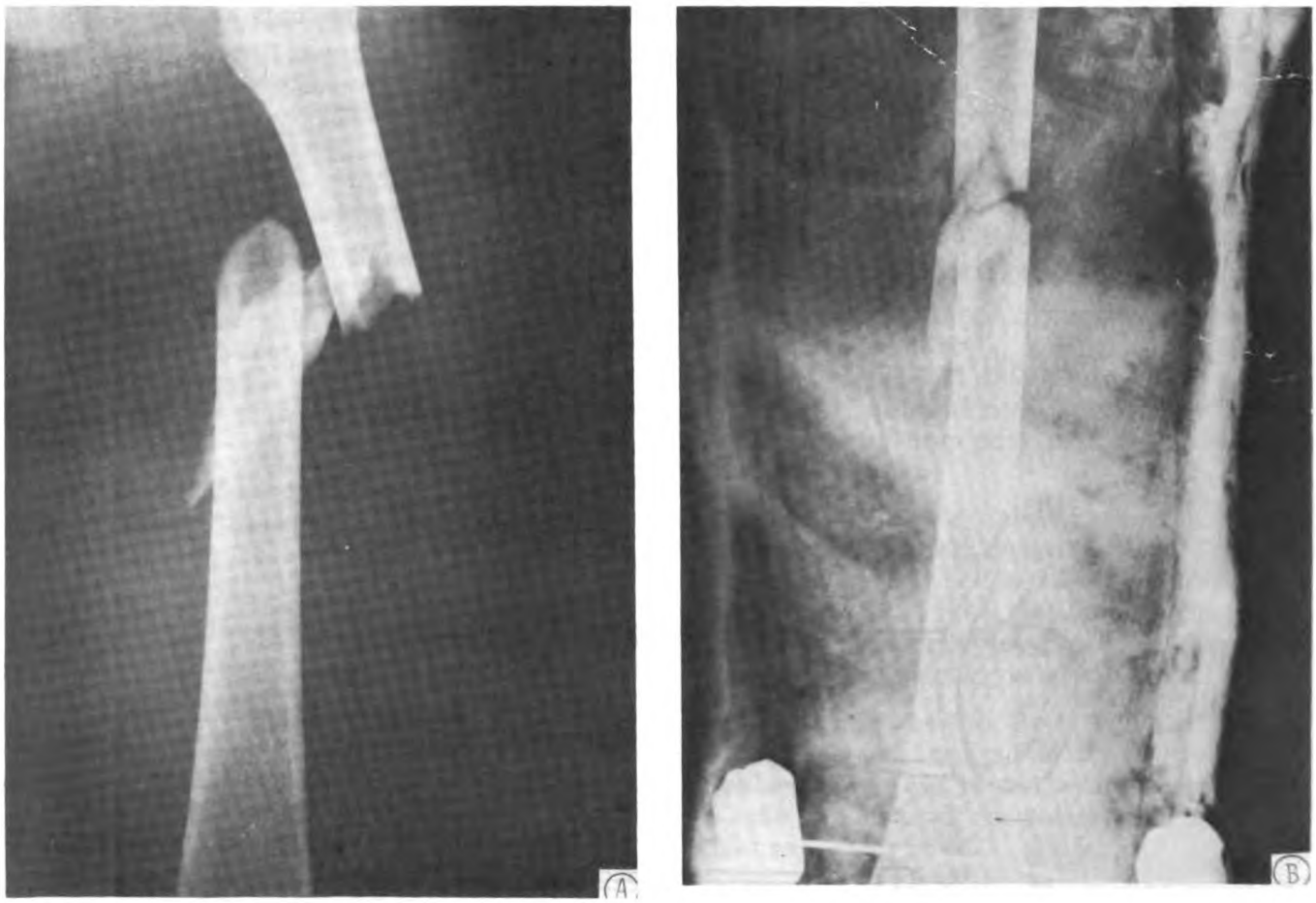


Figure 8–17. X-ray photograph of fractured femur before application of traction (A) and after (B).

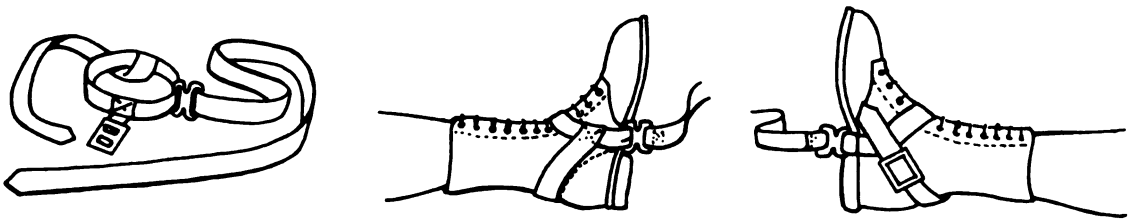


Figure 8-18. Application of traction strap.

a. Adjustments of the Splint for Length.

(1) The telescoping splint may be adjusted to three lengths, one of which will best serve the patient at hand. Too short a splint will not leave sufficient room to apply traction to the foot. Too long a splint will not permit use of the limited length of the traction strap. To determine the best length in which to lock the splint, place the splint alongside the uninjured leg with the ring portion parallel to the ischium (bone in the buttock) and extend the splint about 6 to 8 inches beyond the foot. Lock the holding devices.

(2) Place the adjusted splint, with the buckle on the outside, alongside the broken extremity.

b. Team Application of Splint and Supporting Equipment.

(1) No. 1 member: apply the traction strap over the shoe on the patient's foot (fig. 8-18). If the patient is shoeless or has only low quarter shoes, place plenty of soft materials free of seams and wrinkles over the areas on which the traction strap will pass. After fastening the strap, position yourself so as to face the sole of the patient's foot, run one hand through the large opening in the footrest and under the outside rod of the splint, and grasp the back of the patient's heel. With the other hand, grasp the dorsum of the patient's foot. Initiate and maintain traction throughout the remainder of the application procedure (fig. 8-19). Maintenance of traction is very important. Release may cause serious and unnecessary damage.

NOTE

No. 1 member may have his right hand uppermost or his left hand uppermost when grasping the foot. Whichever way he starts, he should continue. He does not release traction or change position while the splint is being applied.

(2) No. 2 member: raise and support the extremity; maintain this support throughout the application procedure (fig. 8-19).

(3) No. 3 member: apply the splint and attach the supporting equipment in accordance with the following procedure:

(*a*) With the buckle of the splint to the outside and the half-ring bent down at a right angle, ease the splint under the leg, setting the padded half-ring against the ischium (fig. 8-19).

(*b*) Place a pad over the thigh at the location of the splint strap and fasten the strap.

(*c*) Bring the long free end of the traction strap over and under the notched end of the

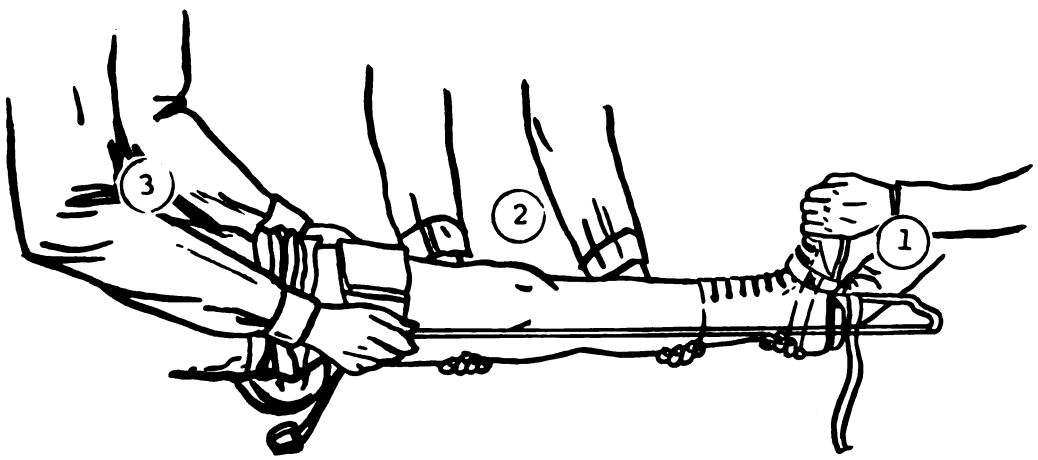


Figure 8-19. Application of traction (No. 1), support (No. 2), and splint (No. 3) to patient's right lower extremity.

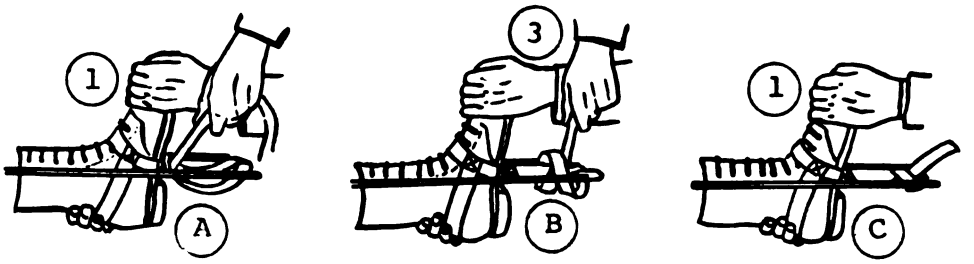


Figure 8–20. Fastening traction strap to splint.

splint; then pass it up through the link at the swivel (fig. 8–20Ⓐ). Secure greeter traction by pulling the strap toward the end of the splint. Fasten the strap securely (fig. 8–20Ⓑ). No. 1 member must continue to support foot until footrest is applied (fig. 8–20Ⓒ).

(*d*) Apply two cravat bandages to help support the leg. If triangular bandages for folding into cravats are not available, use other strong, cloth material that is at least 3 inches wide. Place each cravat across the rods of the splint (fig. 8–21Ⓐ), with the long end of the bandage to the outside. Make sure that neither bandage, when later tied, will be directly over the fracture. Bring ends under splint and loop in opposite direction (fig. 8–21Ⓑ). Bring the longer tail over the patient's leg and tie the two ends over the outside rod (fig. 8–21Ⓒ) with a square knot (fig. 8–12Ⓐ). (No. 2 member must continue to support leg.)

(*e*) Slide footrest over end of splint and into place against shoe or padding on sole of foot (fig. 8–22). (No. 1 continues to hold patient's foot steady, adjusting it slightly as necessary so that heel and sole of shoe or padded foot are in light contact with the footrest.)

(*f*) Apply three or four cravat bandages as before to further support the extremity (fig. 8–23). Make sure that no bandage is placed directly over the fracture site. (No. 2 shifts, then releases support as bandages are tied.)

(*g*) Finally, apply two cravat bandages to further support the foot and ankle and secure the foot to the footrest (fig. 8–24).

- Place one cravat under the back of the shoe, bringing both ends up and crossing them on top of the shoe; then carry the ends toward the sole of shoe and tie on the outside of the footrest.
- Apply the second cravat around the toe of the shoe and footrest and tie. (No. 1 man releases as bandages are applied.)

c. Movement of Patient Onto Litter. After the splint and supporting equipment have been applied, and before the patient is transported, he should be moved onto a litter which, preferably, has been dressed with blankets as shown in figure 8–25.

(1) No. 2 and 3 kneel alongside the patient on the side of the splinted limb. No. 1 member kneels on the opposite side. Each member kneels on the knee nearest to the patient's feet. No. 1 places both hands under the patient's back and thighs; No. 2 supports the legs and No. 3 the shoulders and back. All three then lift the patient onto the thighs of No. 2 and 3.

(2) No. 2 and 3 support patient on their thighs while No. 1 places litter in position alongside their knees, which are touching the ground. No. 1 then helps No. 2 and 3 lower the patient gently onto the litter, supporting patient with hands in same positions as when lifting. As the patient is lowered, the positioning should be such that the footrest on the splint will rest on the

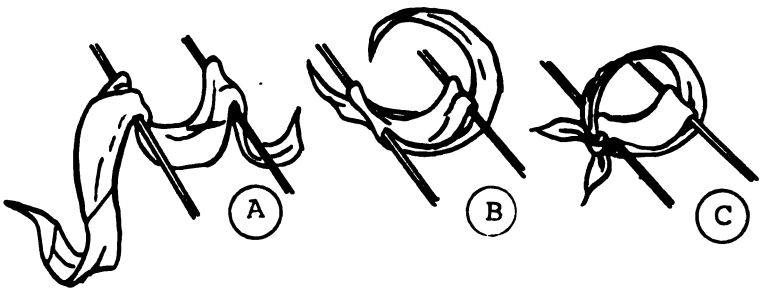


Figure 8–21. Placement of cravats on rods of Thomas splint.

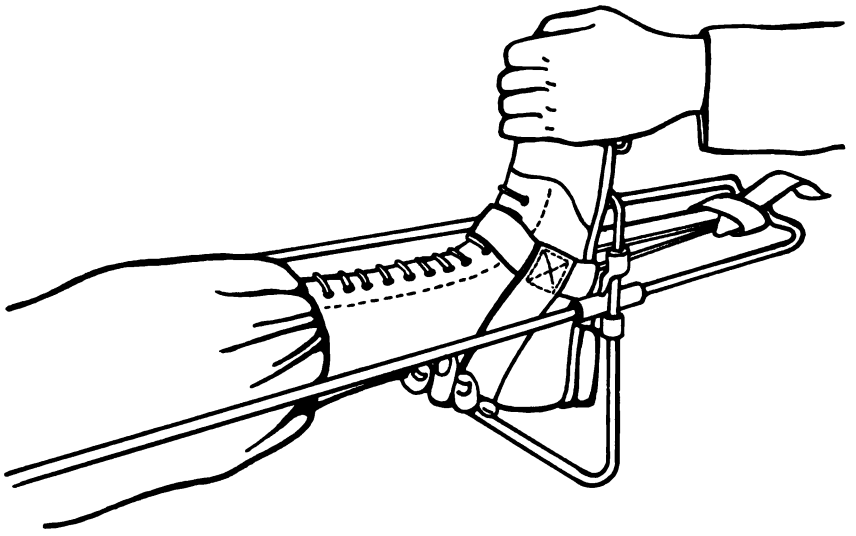


Figure 8-22. Footrest in place.

blankets on the dressed litter 2 inches from the border of and on the litter canvas.

d. Securing Footrest to Litter. The footrest is secured to the litter with a grooved litter bar.

(1) No. 1 member: lift and hold footrest steady a few inches above the litter canvas.

(2) No. 3 member: slide the litter bar under the footrest, guiding the bottom of the footrest into the groove in the litter bar. Start the bar from the direction of the fractured limb and slide it toward the other leg.

(3) Lock the litter bar to the footrest by turning the handle of the locking cam.

(4) No. 1 member: lower footrest so that litter bar is on or at the level of the litter canvas. Release now or after step (5) as indicated.

(5) No. 3 member: buckle litter bar strap tightly around the litter poles.

e. Prevent or Lessen Shock. No. 2 member: cover patient with blankets or other materials as his condition and the situation warrant and place patient in proper position to prevent or lessen shock.

f. Substitutes for Traction Strap and Litter Bar. If a traction strap and a litter bar are not available, roller bandage, cravat bandages, or similar strong material may be used as substitutes. (FM 21-11 gives additional details.)

8-28. Dislocations

A dislocation is the displacement of the normal relationship of the articular (contacting) surfaces of the bones that make up a movable joint. Dislocation places considerable strain on the ligaments which normally hold the bones of the joint in position. There may be injury to these ligaments, the capsule they form around some types of joints, and other soft tissues, as well as hemorrhage into or around the joint.

a. Symptoms. Pain, swelling, and deformity are centered about the joint. Usually there is also loss of motion.

b. Emergency Treatment. A dislocation is immobilized in the same way as a fracture close to the joint. Cold compresses may be applied to the joint to relieve pain and reduce swelling, but the patient's temperature must not be lowered so as

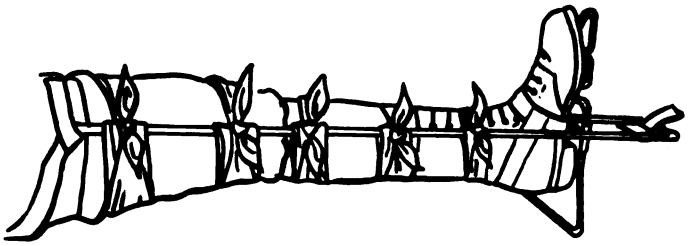


Figure 8-23. Support of extremity by splint, cravat bandages, and footrest.

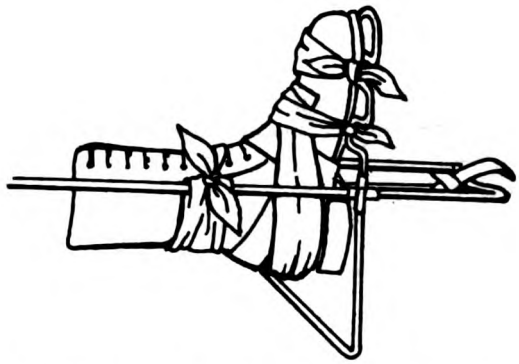


Figure 8–24. Foot supported and secured.

to invite shock. Specialists having good knowledge of joint anatomy and physiology may reduce the dislocation when a physician is not immediately available; otherwise, morphine may be the only means for relieving pain so severe that it could precipitate shock.

8–29. Sprains

A sprain is a joint injury in which the ligaments, capsule, and surrounding tissues are partially torn or severely stretched without dislocation being present. There may have been a partial dislocation that spontaneously reduced itself.

a. Symptoms. The symptoms of a sprain are pain, swelling, reduced motion, and hemorrhage into the surrounding tissues, causing discoloration of the skin.

b. Emergency Treatment. The sprained part should be elevated and treated with cold packs to reduce swelling and relieve pain. A sprained ankle may be supported with an ankle hitch. If there is any doubt as to the severity of the injury, it should be treated as a fracture.

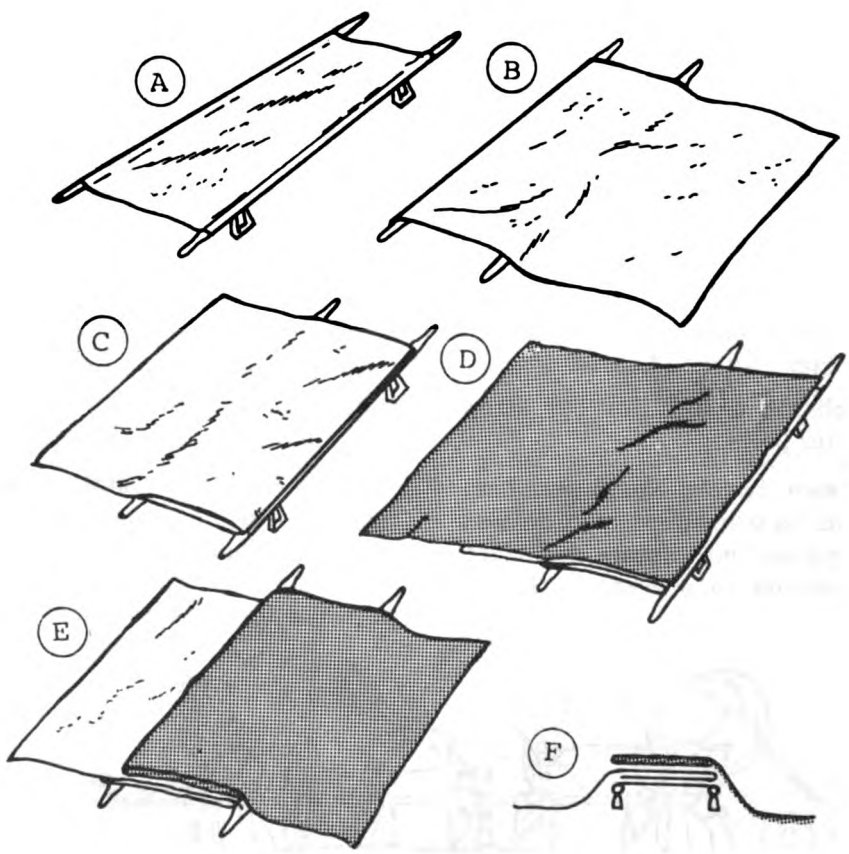


Figure 8–25. Steps in dressing litter with blankets.

Section IX. BURNS

8-30. Causes

Burns are the tissue damage caused by excessive exposure to heat or to other noxious agents including chemicals, electricity, and ionizing radiation. For the most part, burns caused by agents other than heat are treated as thermal (heat) burns.

8-31. Severity

The severity of burns is measured by the degree or depth to which the tissues are injured and by the extent or percent of body surface burned.

a. Degrees of Burns.

(1) *First degree.* A first degree burn is superficial; it involves only the outer layers of the epidermis. A typical example is the sunburn in which the skin is red and painful, but with no blisters or fluid loss. It is not an open wound and, for this reason, does not become infected.

(2) *Second degree.* The second degree (partial thickness) burn extends into but not completely through the dermis, destroying or damaging skin cells, glands, blood vessels, and other structures. This burn is characterized by redness, pain, blisters, and sometimes exuded matter. Body fluids are lost through the damaged skin. The second degree burn is an open wound susceptible to infection.

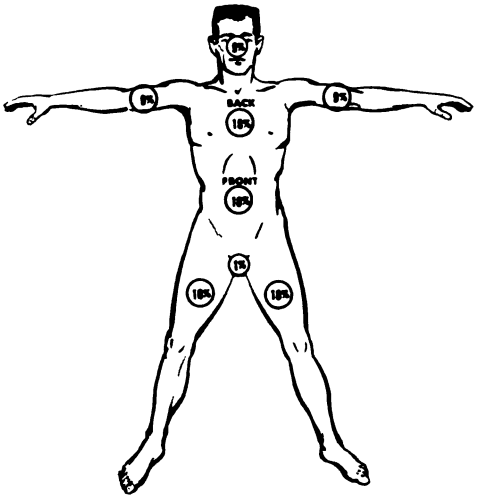


Figure 8-26. Rule of nines for estimating body surface burned.

(3) *Third degree.* A third degree (full thickness) burn destroys all layers of the dermis and may extend through the subcutaneous tissue into the skeletal muscle and underlying bone. There may be amputation of parts. This burn is characterized by insensitivity to pain (since nerve branches in the area are destroyed) and a hard dry surface which is either charred or pearly white. The surface is usually depressed below that of the surrounding, painful, second degree burn. Enormous amounts of body fluids are lost into the damaged tissues and through the nonviable skin. The third degree burn is an open wound highly susceptible to infection.

b. Percent of Body Surface Burned.

(1) An early estimate of the percent of total body surface (TBS) burned is of great importance in determining the amount of fluid replacement necessary to prevent shock and in managing mass casualties. Usually, first degree burns are not included in this estimate. For practical purposes, especially in an emergency situation, second and third degree burns are considered to have the same effect when estimating the percent of body surface burned for fluid replacement purposes.

(2) The percent of TBS is estimated by using the rule of nines (fig. 8-26). The total body surface is divided into the major anatomic parts, each representing approximately 9 percent or multiples of 9 except for the perineal area. The head and neck represent 9 percent; each arm including hand, 9 percent; the anterior trunk, 18 percent; the posterior trunk, 18 percent; each leg including foot, 18 percent; and the perineum and external genitalia, 1 percent. Proportionate areas of these parts may be estimated.

8-32. Pathology in Second and Third Degree Burns

The pathologic process in second and third degree burns consists of three phases, as follows:

a. Phase 1. In the first phase of a burn, there is always some destruction of the skin, which results in a loss of plasma In second degree burns, there is a temporary loss of plasma in the form of edema fluid and a permanent loss through blister fluid or through weeping burned surfaces. Because of the loss of plasma, the local vascular mechanism is affected in the burned area. Excessive permeability and blood stagnation in the involved and adjacent capillaries occur immediately after the injury and cause plasma to seep into

surrounding tissues. This exudate rapidly infiltrates these tissues and gives rise to widespread edema. Edema (collection of fluid) begins to develop at the time of burning and is evident within a few hours. It continues for 2 or 3 days. Excessive capillary permeability is also responsible for the large amount of plasma lost through damage of the skin. In second and third degree burns, particularly the latter, there is an appreciable destruction of red blood cells.

b. Phase 2. The second phase of burns begins, as a rule, on the third day after injury, with a reversal of the phenomena just described. The coagulum which forms on the surface of second degree burns reduces further surface losses. Edema fluid is now absorbed from the injured site into the blood stream. Finally, the arteriocapillary circulation, which was first distributed by vasodilation and then by vasoconstriction, returns to normal. The source of the exudation therefore dries up spontaneously. The eschar which forms on second and third degree burns reduces surface losses.

c. Phase 3. In the third phase of a burn, infection develops. Second and third degree burns are wounds and are subject to contamination from the moment of their occurrence. The existence of any wound exposes tissues to infection from bacteria because of the contact of the wound with the environment. The injury is contaminated almost immediately—sometimes at the moment of occurrence as the patient falls to the ground. Emergency rescue measures, makeshift first aid dressings, careless handling, and personnel breathing on the patient's burns are all factors which lead to established infection.

8–33. Classification

For emergency treatment purposes, second and third degree burns are classified by severity as minimal, moderate, and extensive, depending upon the percent of body surface burned:

Minimal burn	5–20 percent
Moderate burn	20–40 percent
Extensive burn	over 40 percent

8–34. The Mass Burn Situation

If disaster produces mass burn patients on a scale that overwhelms the existing medical capability, emergency and subsequent treatment procedures for the burn patients will, of necessity, be different from that accorded the individual burn patient under ideal treatment conditions. In a mass burn situation, patients with burns that run the gamut from superficial reddening of the skin to deep charring or amputation of parts may be expected. Those with superficial reddening require little or no treatment; those with deep charring may die despite heroic efforts.

a. Treatment of the Patient with Minimal Burn. If the patient's airway is obstructed, he is treated and managed according to the severity and persistence of obstruction. If there is no obstruction of the airway, or if obstruction is relieved by nonsurgical means (positioning or clearing the airway) the patient is given minimal treatment and released from medical care to perform work elsewhere or to receive "buddy care" at the hands of a friend. Release is made with the full realization that many such patients will return later to a medical facility for further treatment after the initial emergency has passed. If possible, patients with 5- to 20-percent TBS should receive the following treatment as a minimum:

(1) *Assurance.* The patient should be assured that despite his pain, his chance for survival (if he is otherwise healthy) is excellent, that all treatment possible under the circumstances is being given to him, and that he may expect to see others more seriously burned performing useful tasks during the emergency.

(2) *Dressings.* Dry dressings should be applied to burns of any area except the face or perineum. If dressings are in short supply, the needs of the moderately burned should be supplied first.

(3) *Ointment.* In the mass burn situation and especially in the absence of analgesic agents and dressings, sulfamylon or other bland, nongreasy ointments may be applied. If none are available, the burn wound should be covered with sterile or clean material to decrease exposure to air and resulting discomfort. If possible, aseptic technique is used in applying the ointment; otherwise, a clean technique is used.

(4) *Fluids and electrolytes.* If the patient is able to take and retain fluids by mouth, sodium chloride and sodium bicarbonate (table salt and baking soda) should be given as follows to help maintain the electrolyte balance of the body:

(*a*) Dissolve one package (4.5 grams) of sodium chloride-sodium bicarbonate mixture in 1 quart or liter of cool or cold water; or dissolve 4 Army-issue salt tablets (½ teaspoonful of loose salt) and 2 issue sodum bicarbonate tablets (¼ teaspoonful of baking soda) in the water. A quart jar, canteen, or a 1-liter infusion bottle that for-

merly contained normal saline or glucose may be used. Crush salt tablets for faster dissolving.

(*b*) Have the patient sip the solution, slowly at first, then increase the rate so that he will have consumed the entire quart (or liter) of solution within 24 hours. Do not give the solution if it is not cool or cold. Warm salt water is unpalatable and often causes vomiting. If patient is nauseated or vomiting, do not insist that he drink the liquid, but have him keep it available to sip as nausea subsides.

(*c*) Give additional amounts of the sodium chloride-sodium bicarbonate mixture when needed by the patient, depending upon the degree and extent of the burn. Other fluid should be given to maintain metabolism and hydration.

(5) *Rest.* The patient should be allowed to rest until it is assured that shock has been prevented or corrected.

NOTE

Antibiotics are withheld from these patients until it is assured that the needs of the moderately burned have been or can be met. The infection that the minimally burned patient group may develop is not expected to be immediately life-endangering, especially if the patient can be treated at a later time and if his nutritional level is maintained near normal. It is a risk that must be taken, a price that must be paid, if the chance to survive is to be given to the most people that are injured. As antibiotics become available for this group, patients with third degree burns should have first priority.

b. Treatment of the Patient with Moderate Burns. The outlook for patients with moderate burns is good if prompt treatment of a lifesaving nature is provided. The factors of immediate concern generally are shock and infection. However, if the airway is obstructed, it must be made patent (open) before other resuscitative and protective measures are taken.

(1) *Shock.* Shock in burns occurs within 2 to 10 hours after injury and lasts up to 48 hours. The degree of shock is directly related to the extent of the burned area and the depth of the burn, as these factors determine the amount of fluid loss. The first phase of one type of shock is characterized by the external loss of fluids from the affected area and the development of edema. The second phase is characterized by coagulation of the burned surfaces and the resorption of the edema fluid. During this period, the substances lost by the patient are chiefly the constituents of plasma; that is proteins, carbohydrates, electrolytes, and water. The goal of treatment in the first few hours after injury is the rapid replacement of lost fluids through the use of Ringers Lactate and colloids in an effort to maintain an adequate urinary output and control the shock. In view of the poor circulatory picture, morphine by the intramuscular route is not recommended. Analgesics may be given if they are available and can be tolerated.

(*a*) *Oral electrolyte solution.*

CAUTION

Great care should be exercised in administering oral fluids to burned patients. They may experience vomiting and possible aspirations which will complicate their early care.

Shock in burn patients may be prevented or reversed with the administration of the salt-soda solution by mouth. The patient's fluid and metabolic requirements should be met as far as possible by the oral route; those which cannot, by the intravenous route.

(*b*) *Selection of intravenous replacement fluid.* When the burn occurs, red blood cells in the involved vessels are damaged, destroyed, or coagulated. This constitutes the extent of red blood cell loss. None leaks out through the burn with the plasma. Therefore, whole blood, even if it were available, is not the replacement fluid of choice during the early phase of treatment. Ringers Lactate, normal saline, glucose solutions, colloids, or serum albumin in injection water may be given as available and as necessary to meet the specific requirement of the patient.

(*c*) *Formula for fluid replacement.* While no hard and fast rule can replace good judgment in individual patient care, the formula below may be used as a guideline for estimating the patient's minimum fluid requirements for the first 24 hours following a burn:

Colloid _____ 0.5 ml. x body weight in kilograms x percent TBS
Electrolyte ___ 1.5 ml. x body weight in kilograms x percent TBS
Metabolic ____ 2,000 ml. glucose (dextrose), 5 percent, in water.

Using this formula, the first 24-hour postburn

fluid requirements of a patient weighing 70 kilograms (154 pounds) and having a 30-percent total body surface burn would be calculated as follows:

Colloid	0.5 x 70 x 30 =	1,050 ml.
Electrolyte	1.5 x 70 x 30 =	3,150 ml.
Metabolic		2,000 ml.
Total		6,200 ml.

(Note that the percent TBS is used as a whole number, not as a decimal.)

(*d*) *Administration of replacement fluid.* One half of the quantity estimated as necessary should be given in the first 8 hours and the balance at a uniform rate over the succeeding 16 hours. The glucose, being of less immediate importance unless the patient is grossly undernourished, should be deferred until after the patient has responded to electrolyte and colloid solutions. During the second 24 hours, the colloid and electrolyte requirements are roughly one half the amounts recommended for the first 24 hours; the normal metabolic requirement remains the same. After 48 hours, fluids should be supplied as far as possible by the oral route.

1. Measure the urinary output hourly. In the emergency medical treatment situation, the preferred method of collecting the urine is by means of a catheter inserted into the urinary bladder by way of the urethra and left in place to drain into a suitable container for measurement. If a catheter and a specialist experienced in its placement are not available, arrangements should be made to catch all the patient's urine in a suitable container for measurement. The catch method, which depends on periodic voiding by the patient, is not as reliable as the catheter method; however, it does provide a rough guide that is especially useful in judging a too-rapid rate of fluid administration.

2. Adjust the rate of fluid administration to insure not less than 30 ml. of urinary output per hour. If the output exceeds 50 ml. per hour, the rate of administration should be curtailed.

(2) *Infection.* Burns of the second or third degree are particularly susceptible to infection: first, because they are open wounds and, second, because the matter exuded through them is most favorable to the growth of many species of pathogens. To a greater or lesser extent, burns become contaminated with infectious organisms almost immediately after incurrence. The objective in controlling infection is to prevent further contamination and to prevent development of the pathogens already present.

(*a*) *Aseptic technique.* To the maximum extent possible, aseptic technique is employed in all manipulations of the patient. All constricting articles such as rings, bracelets, wristwatches, belts, boots, and leggings are removed, but the patient is not undressed. Cleansing and debridement of these wounds are left for the physician performing initial surgery. All exposed burns except those of the perineum and face are covered with dry dressings. Management of the sterile dressing supplies should be such that these patients have first priority among burn patients. If sterile dressings are not available, clean wrappings such as sheets, towels, or even plastic garment covers may be used to protect these wounds from further contamination. If no surgical masks or suitable masking materials are available, personnel must refrain from talking over or breathing on the patient, or coughing or sneezing in his vicinity. If available, sulfamylon ointment may be applied to burns that must be left exposed if pain in these wounds interferes with resuscitation. Other ointments may be applied to the burn wound as directed by the physician.

(*b*) *Chemoprophylaxis.* Systemic antibiotics must be given as available if serious infection is to be avoided. Penicillin may be used with these patients, but should be conserved until the needs of the group are met. In addition, an initial or a booster dose of an appropriate antitetanus preparation should be given as soon as it is available.

c. Treatment of the Patient With Extensive Burns. With the best of care and treatment conditions, only about 50 percent of these patients survive more than a few days. Under the limited medical capability envisioned during the first 72 hours after onset of a mass burn situation, survival rate among these patients is expected to be much lower. Diversion of medical resources to these individuals when their chance for survival is so limited adds tragedy to disaster because it deprives others less gravely injured of the treatment, care, and supplies which, if applied early and correctly, can help them back to health. The extensively burned patient, therefore, has no priority for replacement fluid, dressings, antibiotics, or time of personnel except for those few moments needed to give analgesics or other medications available for the relief of pain. Those who survive the emergency phase are then given treatment and care to the extent possible that is not detrimental to the welfare of patients in higher priority treatment categories.

d. Special Emergency Treatment for Regional Burns.

(1) *Respiratory tract.* A face burn of instantaneous origin such as that from a flash or flame is almost always accompanied by inhalation injury to the respiratory tract. This damage is caused by the inhalation of superheated air or hot, irritating gases, especially in a closed place. Early signs of inhalation injury include burned (singed) nasal hairs and redness of the linings of the nose and throat. After a few hours, other signs appear, including difficulty in breathing; bluish discoloration of the skin, lips, and nails; and the presence of fluid in the air passages. All of these latter signs point to hypoxia, which must be relieved immediately. Coma position (fig. 8–13) may be sufficient to relieve respiratory distress. If all or part of the fluid obstructing the airway is from replacement fluid being infused too rapidly, temporary stoppage or slowing of the infusion, together with the coma position, may clear the airway. If the patient's condition will not permit rapid clearance of the airway by these methods, an emergency surgical airway should be made without hesitation (sec. III).

(2) *Joints.* Burns that destroy the skin over joints may heal with contractures which will limit or prevent movement of the joints. Beginning with emergency treatment, the joints should be placed in the best position for function: the knee, flexe slightly (5° to 10°); the ankle, placed in the normal position for standing; the elbow, straight; and the hand, positioned for writing.

8–35. Mortality Among Burned Patients

As a practical matter, a burn of more than 20 percent of the body surfare endangers life. In addition, the patient's age influences the outcome of a burn; the old and the very young do not withstand burn injuries well. A burn of more than 30 percent is generally fatal to adults in the absence of adequate treatment. The outlook also varies according to the location of the injury. Facial burns are often accompanied by complications involving the eyes or the respiratory passages, and serious risk of infection accompanies burns of the perineum. Most deaths among burn patients during the first few hours or days after injury are attributable to shock. Some form of respiratory obstruction accounts for most other deaths during this early period. Pulmonary edema from burns about the face and neck or from inhalation of noxious agents, superheated air, or superheated vapor are prominent forms of respiratory obstruction. Gastrointestinal bleeding from a stress ulcer may account for some early deaths. Later mortality is almost always due to infection.

Section X. CARE OF SPECIAL WOUNDS

8–36. Head Wounds and Injuries

Basically, the head may be thought of as consisting of two major structures: the skull and the brain.

a. Skull. The skull is an essentially hollow structure. On the outside are the musculature, skin, and appendages of the face and scalp. The scalp and facial structures are attached to the bones of the skull by means of a thin, tough, fibrous sheath, the periosteum, which is intimately attached to the bones. Within the face are the structures of the mouth, nose, and pharynx. The largest hollow of the skull, the cranium, contains the brain. The envelopment of the brain by the cranium is complete except for the hole at the base of the skull through which the spinal cord connects with the brain. Small holes in the cranium through which cranial nerves and blood vessels pass are sealed by the cranial lining.

b. Brain.

(1) The brain is the primary organ of life and the chief component of the central nervous system, which consists of the brain and spinal cord and controls all activities of the body. The brain controls directly the functioning of the eyes, ears, face, heart, and respiratory apparatus by means of electrical charges passed between these structures and control centers in the brain by the cranial nerves. Interference with these control centers results in erratic behavior or cessation of function in the organs and structures they control.

(2) The brain lies very close to but not directly against the bones of the cranium, being separated from the cranium by the meninges and fluid. The outer surface of the brain is intimately invested with one of the meningeal membranes, the pia mater, which contains many small blood vessels. The cranium is lined with the dura mater, a tough, fibrous, relatively thick, meningeal membrane. Between the dura and the pia are (1) the thin subdural space, which contains a little fluid, (2) the delicate, net-like arachnoid membrane, and (3) the subarachnoid space filled with cerebrospinal fluid. This fluid, which is clear, salty,

and very watery, bathes the spinal cord and the outer and certain inner surfaces of the brain, and is essential for life.

8–37. Classification of Head Injuries

The definition and the discussion of head injuries are limited to those involving the scalp, cranium, and its contents. Head injuries are divided into two main classes, open and closed. (Wounds of the facial and pharyngeal structures are covered in paragraph 8–45.)

a. Closed Injuries. Except for a possible bruise or contusion, there is no obvious external damage. Injury may be to the brain itself or to the pia or arachnoid meninges (fig. 8–27). Rupture of the blood vessels of the pia is particularly important in closed injuries. Blood spilled onto brain cells is a foreign substance and disturbs the functioning of these tissues. Blood collecting within the cranium exerts pressure against the brain. If there is no fracture of the skull, or if skull fracture is such that the integrity of the dura is not dis-

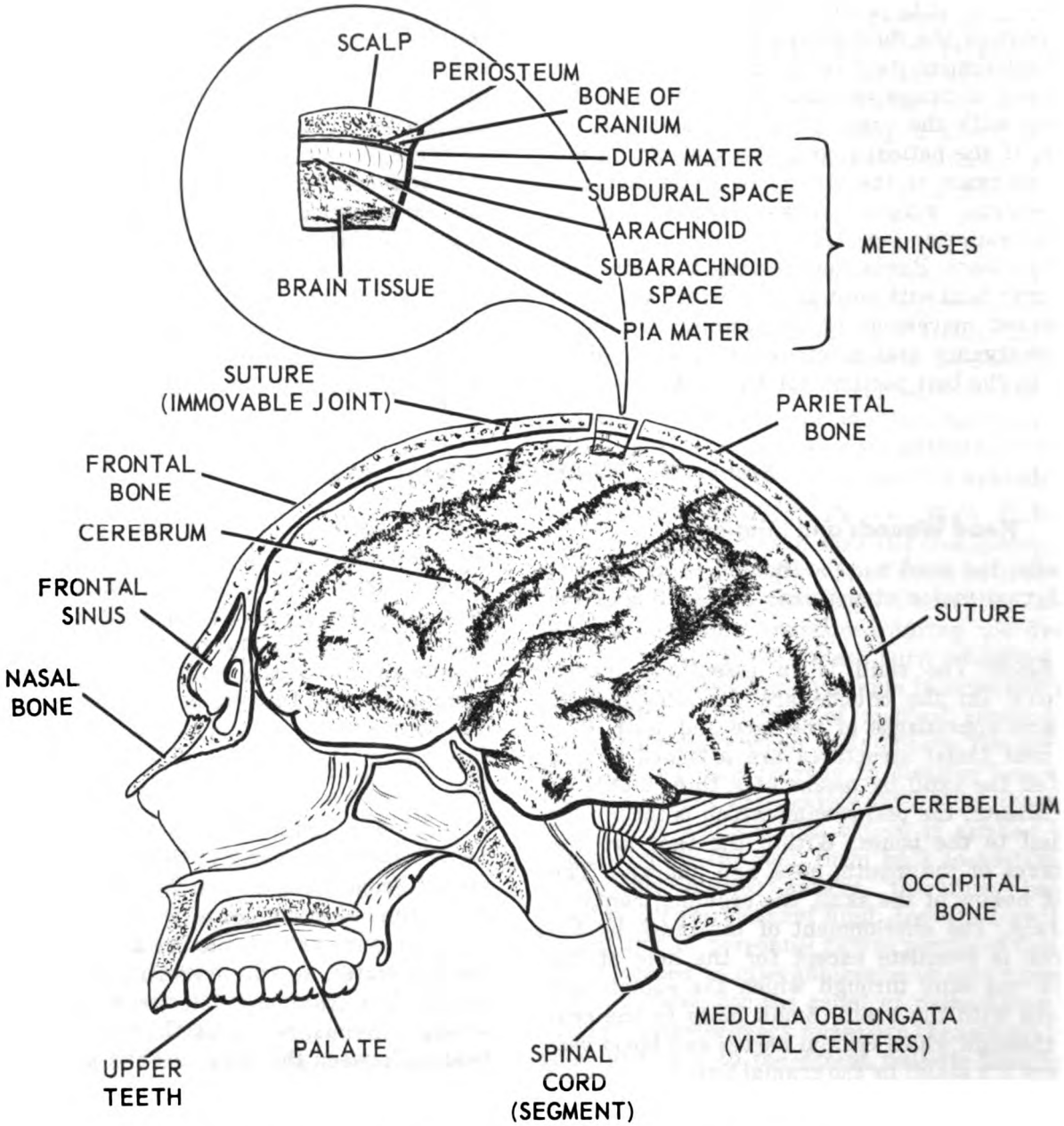


Figure 8–27. View of left side of brain with left side of skull and the mandible removed.

turbed, the cranium is unyielding. If the skull is depressed or displaced inwardly, it may exert direct pressure on the brain even without formation of a hematoma (blood pool).

b. Open Wound. In an open wound there is obvious external damage. Open wounds of the head are subclassified according to whether or not the integrity of the dura is disturbed.

(1) *Nonperforated dura mater.* The wound may be no more than a laceration of the scalp which, although not to be taken lightly, may not be serious. There may be one or more fractures of the skull, but the dura is not perforated. In either case, the possible internal damage is likely to be or become more serious than that of the scalp and skull. If the skull is fractured, it will hold in the same manner as a closed injury against pressure of any hemorrhage that may occur within the cranium.

(2) *Perforated dura mater.* With the skull and dura opened, the meninges are exposed to the open air and to pathogenic invasion. If the delicate meninges are opened, the brain itself is exposed. The skull is fractured in such a way that it is no longer a closed vault, part of it may be torn away, and brain tissue may be extruding through the opening.

8-38. Assessment of Head Injuries

All head injuries are potentially dangerous, not only because of the immediate tissue damage and increased susceptibility to infection, but also because of the probability that some vital area or special sense is or will become involved. For these reasons, it is extremely important that all signs and symptoms referable to the nervous system be carefully noted and recorded with the time of their occurrence or observation.

a. State of Consciousness. A notation of the state or states of consciousness observed in the patient will greatly assist the physician who examines, assesses, and treats the patient later. For this purpose, the following descriptive adjectives should be used, as appropriate, to define the state of consciousness observed.

- *Conscious.* Patient is alert and oriented in time and space.
- *Confused.* Patient is alert but disoriented and excited. (For purposes of taking fluids by mouth, patient is conscious.) The disorientation and excitement, which are not in keeping with the total situation, may be temporary and have a psychological basis in addition to or instead of brain injury.
- *Somnolent.* Patient is excessively drowsy or sleepy, but responds to stimulation.
- *Semicomatose.* Patient responds to painful stimuli but makes no spontaneous movements. (For purposes of taking fluid by mouth, patient is considered unconscious.)
- *Comatose.* Patient does not respond to any applied stimulus; he is unconscious in the usual sense.

b. Pupil Size. Normally, pupils of the eyes tend to become very small in the presence of strong light and to dilate as the light fades. Dilation in the presence of strong light indicates central nervous system impairment. Normally, the pupils are matched in size. When neither eye is obviously injured and the pupils are of unequal size, brain impairment should be assumed in the emergency medical treatment situation.

c. Muscles. The musculature on one or both sides of the face may droop due to lack of stimulation from the brain through the cranial nerves serving the facial muscles. There may be loss or impairment of speech. Paralysis and lack of firmness in the muscle mass of any part or region when there is no damage in the part nor suspicion of spinal cord damage is presumptive evidence of impairment of the brain area controlling movement of those muscles.

d. Vital Signs. The vital signs—temperature, blood pressure, respiration—are especially important in head injuries since changes in these indices frequently indicate the onset of complications.

8-39. Symptoms of Closed Head Injuries

Headache, nausea, dizziness, and loss of consciousness (which may be brief, intermittent, or extended) may accompany a closed head injury, depending upon the particular injury and its severity. If injury is from impact with a blunt surface, an elevated contusion (bruise) forms when blood and other fluids collect in a pocket in the subcutaneous tissue between the dermis and the skull; there may be fracture in which part of the skull is displaced inwardly. In the more severe injuries, vomiting and paralysis of some muscle group may occur. The patient may bleed from the nose, mouth, or ears in the absence of obvious injury to these parts. Cerebrospinal fluid coming from the nose or ears indicates a grave injury.

Normally a clear liquid, cerebrospinal fluid becomes cloudy when mixed with small quantities of blood. Signs of increasing intracranial pressure include: elevated blood pressure, slow pulse, restlessness, dilation of one or both pupils, decreased respiration, cyanosis, delirium or irritability, and paralysis. Unless a qualified person is available to relieve the pressure by opening the skull, increased respiratory failure, heart failure, and death may be expected.

8–40. Symptoms of Open Wounds of the Head

The patient may be either conscious or unconscious. Signs of intracranial pressure and internal damage, if any, are the same as for closed injury.

a. Lacerations. Lacerations of the scalp bleed profusely because the blood vessels, which are quite numerous, do not constrict and retract as do those of other areas of the body. Scalp lacerations gape open because the scalp, when intact, envelops the skull very tightly.

b. Skull Fracture. The skull may be misshapen, yielding, or minus parts or pieces.

8–41. Emergency Medical Treatment of Head Wound

a. Assure an Open Airway. Clear the air passage of any vomitus, mucus, or debris as necessary; place the patient in coma position (fig. 8–13); turn the semicomatose or comatose patient from one side to the other every 20 minutes. As the patient's condition stabilizes, turning him every hour may be sufficient. Maintaining an open airway is usually not a problem for patients who have only scalp lacerations; the first consideration with these patients is to control the profuse bleeding.

b. Control Bleeding and Protect Wound. Place a sterile pressure dressing over the wound (para 8–14); do not remove or disturb any foreign material which may be in the wound; leave any protruding brain tissue as it is, and apply the dressing over this tissue.

c. Prevent or Treat Shock. Apply measures for prevention or treatment of shock described in paragraph 8–16 with the following exceptions and modifications:

- Do not put patient in head-low position.
- Do not give morphine.
- Give necessary fluids by mouth if possible (patient must be conscious and not nauseated). Intravenous fluids are rarely needed. If required, give them very slowly.

d. Observe Patient. Observe the seriously injured patient for hours or until he can be transported to surgery. Take and record vital signs (which include pulse, respiration, and blood pressure) periodically. When possible, seek help from professional medical personnel if symptoms indicating intracranial injury or increased intracranial pressure (para 8–39) appear.

8–42. Spinal Wounds and Injuries

The spinal cord is enclosed by the spinal or vertebral column. This column extends from the base of the skull to the coccyx. The cord extends from the brain stem to the second lumbar vertebra; however, the subarachnoid space, which contains cerebrospinal fluid, continues into the vertebra of the upper sacrum. The spinal cord may be thought of as an extension of the brain. Body processes and areas not controlled directly by the brain and cranial nerves are controlled through nerve branches connected with the spinal cord. In general, spinal nerves controlling the upper body and upper abdominal structures are connected high along the cord in the shoulder or neck region; those for the lower extremities, rectum, and urinary bladder are connected toward the lower end of the cord. If the cord is cut across, there is paralysis of all structures and functions that depend on nervous connections with the cord that are below the point of the cut.

8–43. Classification of Spinal Cord Injuries

Injuries of the spinal cord are classified as follows:

a. Direct Injury. Direct injury to the cord, the nerve roots, or both may be caused by the impact of missiles or the shattered bone fragments. The cord may be crushed, pierced, or cut in two. This type of injury is generally an open wound.

b. Indirect Injury. Indirect injury to the cord may be caused by the disturbance of tissues near the spine by the passage of high-speed missiles, as well as by other more or less violent forces such as crushing, falls, or blows. This type of injury, which is usually closed with respect to the spinal column and cord, is of a lesser degree than direct injury. It takes the form of concussion, hemorrhage, or edema of the cord. The cord may cease to function below the site at which the force is applied even though the cord itself receives no

direct injury. Such dysfunction may be temporary or long lasting. Injuries to the spinal column in which the cerebrospinal fluid is rapidly depleted may be fatal.

8–44. Emergency Medical Treatment for Spinal Cord Injury

a. General. Immediate and obvious symptoms of spinal cord injury parallel those of a fracture of the spinal column in the region of the back (para 8–25*b*). In the emergency medical treatment situation, the patient with spinal cord injury must be treated as if the spinal column were fractured, even when there is no external evidence. Shock must be prevented (para 8–16) but morphine, barbiturates, or other central nervous system depressants should not be given. The patient's clothing, if left on, should be loosened, and everything removed from pockets. Shoes and moist socks should be removed. Bony prominences, including the scapulas, elbows, pelvis, and tibias, should be padded in keeping with the spinal injury to prevent or retard development of pressure sores due to prolonged compression of the blood vessels serving the flesh between the bones and the supporting surface (litter). The patient should be protected from temperature extremes, but necessary covers should not press against paralyzed parts.

b. Psychological Considerations. While the initial outlook for most or all patients with spinal cord injuries is for a long period of disability, their situations are by no means hopeless despite the fact that conditions for existence may be primitive and definitive medical treatment delayed. In view of this, the attitude of specialists should be one of expectancy of success, not of doom or indifference. Conversely, false hopes and unrealistic optimism should not be generated or fostered. The patient's condition should be discussed with him candidly and from the standpoint that his own active interest and cooperation are needed in each step of management.

c. Neurologic Information.

(1) If a neurologic examination cannot be done by a physician, the specialist should obtain and record answers from conscious patients to the following questions:

- Did paralysis occur at the time of the injury, or did it begin later?
- Has paralysis improved (lessened) since the onset?
- Does it hurt here (where light finger pressure is being applied at various parts of the body trunk and extremities)?
- Can you feel that (light to moderate finger pressure applied to areas where sensitivity to touch seemingly is lost)?
- Can you wriggle the toes on your right (left) foot?
- When was the last time you voided urine? Was this before or after the injury; before or after onset of paralysis?

(2) During or after examination of the abdomen, evidence of paralysis of the intestinal movements and of retention of urine should be sought.

(*a*) If no movement can be felt with the hands or if no functional sounds of the intestines can be heard when the ear or a stethoscope is placed against the patient's abdomen, it may be assumed for the moment that intestinal movement has stopped (*f*, below).

(*b*) A careful and very discriminating examination of the abdominal region with the fingers just above (toward the head from) the pubis will detect the urinary bladder if it is filled to near capacity. If the patient is unable to void this urine, it may be assumed for the moment that the bladder is paralyzed (*e*, below).

d. Prevention of Pressure Sores. The paralyzed patient, having been placed on a litter or rigid substitute, is turned over every two hours to stimulate circulation and help retard development of pressure sores. An easy and effective way to turn a paralyzed patient is by means of a litter sandwich, which consists of two litters, one above and one below the patient (para 5–132). To avoid shock, any turning must be done smoothly, with the patient and the litters kept in a plane parallel to the ground so that neither the head nor the foot of the litter sandwich is raised higher than the other end.

- Data and time of turning are marked on the patient's FMC.
- Toilet of the skin areas that are not uppermost is carried out as thoroughly and in as sanitary a manner as possible under the circumstances. Cleansing of the perineum is carried out or completed, especially after an enema or bowel movement, preferably with soapy water and then rinse water, if available in sufficient quantities after higher priority uses have been served. A mild antiseptic solution made from Wescodyne, benzalkonium chloride, or Lysol may be used without rinsing. Dry paper may be used with caution, realizing that tender tissue may be damaged when the patient is insensitive

to pain. Alcohol, alkali, chlorine, strong soap solutions, and the like are not applied to the perineum. In addition, points at which pressure sores are most likly to develop should be massaged lightly to help restore circulation. If pressure sores develop, they are treated as open wounds.

- Disinfection of the litter just removed from the patient is carried out as necessary, especially if soiled by excreta.

e. Bladder Function. Emptying the urinary bladder paralyzed by injury to the spinal cord becomes a problem not long after injury. In the emergency medical treatment situation, the best way of dealing with the problem is urethral catheterization. Using strict aseptic technique, the catheter is inserted through the orifice of the urethra and pushed gently inward until the tip is well within the bladder; it is held in place by taping that does not impede circulation. As there is danger of injury to the patient of doing more harm than good, insertion of the catheter is done preferably by a person skilled in the technique. The urine issuing from the catheter is caught and measured. The desired daily urinary output is about 2,000 ml. If the patient is a male, the exposed portion and end of the catheter should be brought out over the abdomen, and the penis taped or bound to the abdomen to prevent sharp bends and pressure sores in the urethra.

f. Bowel Function. Paralysis of the intestines frequently accompanies injuries, including concussion, of the spinal cord at the level of the neck and thorax. In paralysis, the feces are retained and tend to become impacted. Symptoms of impacted feces include abdominal distention, headache, profuse sweating, rise in blood pressure, and respiratory embarrassment due to pressure on the abdominal surface of the diaphragm. This condition should be prevented. Relief by enema is advantageous since personnel are prepared to deal with and confine the resulting soiling and to dispose of the waste in a sanitary manner. An enema should be given soon after the patient is placed on the one-hole litter and repeated at least every second day thereafter. In this situation, the enema may consist of nothing more than the instillation of sufficient tap (drinking) water, mild soapy water, or salt-soda water in the rectum to cause emptying of the bowels. If tap water is in short supply and normal saline is in plentiful supply, the saline may be used. If a regular enema setup is available, it should be used; otherwise, an infusion setup without the intravenous needle may be used. A team of two may give the enema to the patient who is face up on the one-hole litter.

(1) Fill the enema can (infusion bottle) with 500 to 1,000 ml. of the warm solution to be used.

(2) Expel air from the tube, then clamp it.

(3) Lubricate the end and about 4 inches of the length of the tube.

(4) Insert the tube 3 to 4 inches into the patient's rectum.

(5) Release the clamp, hold the tube in the rectum, and raise the fluid supply 1¼ to 2 feet above the litter if in enema can, or 4 feet if in infusion setup. Raising the enema can higher than 2 feet may cause the fluid to escape before it has had time to soften the feces. If there is fluid escape other than seepage or if the patient complains of cramp-like pains, lower the enema can a few inches so the fluid will run more slowly. Clamping the tubing, thus stopping the fluid for a few minutes, may assist the patient to retain the enema.

(6) Have the second member of the team hold a bucket, bedpan, or other suitable container beneath and in close proximity to the patient's perineum to confine the excreta.

(7) When the bowel has been sufficiently flushed, withdraw the tube.

(8) Carry out toilet of the patient as thoroughly as possible and complete it when the patient is turned.

(9) Empty the bucket or container and the enema setup in a sanitary manner, clean, and disinfect by exposure to sunlight. Infusion apparatus used for this purpose may be discarded as infectious waste.

g. Nutrition. The patient's fluid intake, by mouth if possible, should be on the order of 3,000 to 4,000 ml. per day or more, depending on the loss by sweating. The patient should be fed generous portions of a balanced diet, except that gas-producing foods such as cabbage, dried beans, and turnips should be withheld. As the patient will develop anemia later, foods high in iron such as liver, beef, bran breakfast cereals, and molasses make excellent dietary constituents.

8-45. Wounds of the Face and Neck

FACE WOUNDS

Bleeding from wounds of the face is usually profuse because of the many blood vessels in the re-

gion. Hemorrhage is difficult to control. The upper airway may become obstructed by blood, mucus or foreign matter, causing respiratory failure and death. Maintenance of an open airway and control of hemorrhage are emergency medical treatment procedures to be performed first.

EMERGENCY MEDICAL TREATMENT

1. Clear the mouth of blood, mucus, broken teeth, detached bone fragments, removable dentures, and any foreign material. Avoid pushing anything into the pharynx.
2. If necessary, apply digital pressure (para 8–14*a*(3)(*b*)) to control hemorrhage while clearing the airway.
3. Apply sterile pressure dressings over wounds involving the skin. Do not place any dressing inside the patient's mouth. If an alternate airway (5, below) is not provided, dressings must not occlude the oral and nasal openings.
4. Place the patient in semiprone (fig 8–13) position to allow drainage of the airway. If he prefers, he may sit with knee drawn up and with his head resting on his arms folded across his knees.
5. Watch the patient closely for signs of airway obstruction, especially by edema fluid which forms belatedly after the wound occurs or by blood if the pharynx or mouth cavity has open wounds. If postural drainage is inadequate or if dressings required to control hemorrhage must occlude the airway, summon a person experienced in the performance of emergency surgical airway technique, or perform emerency surgical airway operation (para 8–6 through 8–8).
6. Prevent or treat shock by general measures (para 8–16) except—
   - Do not use head-low position.
   - Do not give morphine.
7. Check for signs of closed head injury (para 8–39).

WOUNDS OF THE NECK

1. Hemorrhage from a neck wound, unless attended essentially at onset, is rapidly fatal. Major concern in emergency treatment of patients surviving neck wounds other than those involving the spinal column lies in maintenance of an open airway. The airway in the neck region may be obstructed by blood, mucus, edema fluid, plasma (if the throat is burned), and broken parts of the trachea and larynx. Clearing the mouth (not the pharnyx) with the fingers, together with postural drainage in the semiprone position, may be successful. If not, an emergency surgical airway must be performed promptly by the most experienced person available (para 8–6 through 8–8).
2. Such dressings as may be applied to the neck must be tied upward over the head or downward under the opposite armpit, NEVER around the neck, to avoid pressure on the trachea.
3. Shock is managed by general measures (para 8–16) with these exceptions—
   - Do not use the head-low position.
   - Do not give morphine, which depresses the cough reflex.

8–46. Wounds and Injuries of the Chest

a. In addition to wounds of the thoracic wall, injuries of the chest may include wounds of the lungs, trachea, major bronchi, esophagus, diaphragm, heart, and the great vessels. These wounds may occur in any variety of combinations. As any of them may be followed by disturbances of the pulmonary and cardiac functions which can prove fatal if not corrected, the only safe plan is to regard all chest wounds as potentially serious, however small the wound may be and however good the patient's condition may appear at the first examination.

b. With chest injury, the primary disturbance to vital processes is mechanical.

8–47. Pneumothorax

Pneumothorax is a condition in which a quantity of air is between the visceral and parietal layers of the pleura that lie between the lung and the chest wall. Normally, there is no space as such between these two layers, but when air comes between them, a true space is created. If a great enough space is created, the affected lung collapses. Two types of pneumothorax are of importance: open pneumothorax and tension pneumothorax.

a. Open Pneumothorax (Sucking Chest Wound). Open pneumothorax occurs in wounds of the chest wall which permit air to enter and leave the pleural space during respiration (fig. 8–28). A distinct sucking sound is heard at the wound site as air passes through bloody froth into and out of the wound. In open pneumothorax, the lung on the affected side falls away from the chest wall. During inspiration, air is drawn from this lung into

the opposite lung, and the mediastinum (space between the two lungs that contains the heart, great vessels, esophagus, and trachea) is displaced toward the uninjured side. During expiration, air is blown from the lung on the sound side into the other lung, and the mediastinum is displaced toward the wounded side. These phenomena are called paradoxical respiration because the lung on the injured side deflates on inspiration and inflates on expiration. In paradoxical respiration, the quantity of air which reaches the lungs from the atmosphere is less than normal. The air in the lungs contains an excess of carbon dioxide and a diminished proportion of oxygen because it is being rebreathed repeatedly. As breathing difficulty increases, the mediastinal movements become more violent, and venous return to the heart is impeded; cardiac output is diminished; and a worsening cycle of hypoxia is perpetuated.

b. Tension Pneumothorax. In tension pneumothorax, as in the open type, air is sucked into the chest cavity through a wound in the chest wall. But in tension pneumothorax, this same amount of air does not then escape through the wound. Structures in or near the wound obstruct the wound partially or wholly and prevent the escape of air. Through this valve-like action in the wound, an increasing amount of air is built up on the injured side. The injured lung is compressed, and the mediastinum is shifted to the uninjured side where it compresses the uninjured lung. It does not return to its normal position in the midline of the chest. Breathing is difficult; each inspiration compresses the vital structures of the thorax more and more. Spittle and cough products may be bloody. Cyanosis becomes acute, hypoxis increases, and death from cardiac compression or anoxia soon follows.

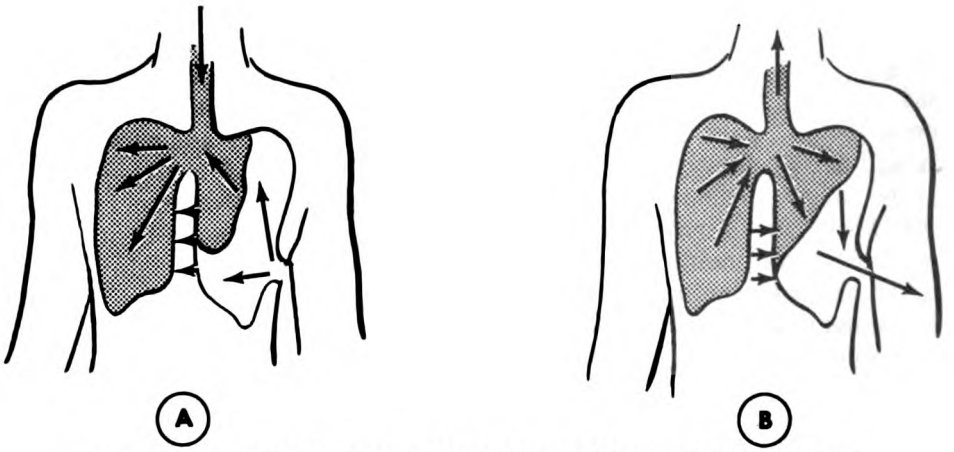


Figure 8–28. Schematic showing effect open pneumothorax has on respiration.

EMERGENCY MEDICAL TREATMENT FOR PNEUMOTHORAX

1. *Make the wound airtight.* Once the wound is sealed, the air pocket in the chest cavity is absorbed over a period of time, and the thoracic structures return to normal positions. Sometimes before or sometimes after the wound is sealed, this air may collect in the subcutaneous tissue of the chest, neck, face, or limbs. The patient looks inflated, which he is. However, when this inflation (emphysema) originates with the wound of the chest wall, it is only temporary and is no cause for alarm. Its presence should be noted on the patient's FMC, along with other symptoms and treatment. The wound is sealed by one of the methods described below, or by similar method that achieves the same end, except that surgical suturing is not done.

   a. *Dressing and tape.* Apply a sterile pressure dressing over the wound. Seal the dressing by applying wide strips of adhesive tape across it and for several inches onto the surrounding skin, overlapping the strips, and making sure the taping does not hinder respiration on the uninjured side. Apply each strip of tape forcibly as the patient exhales. If the patient is conscious, have him exhale forcibly and hold his breath as each strip is applied. If vaseline-impregnated dressing is available, use it in preference to dry dressing. If vaseline, surgical lubricant, or similar nonirritating substance of high viscosity is available, impregnate the dry dressing with it to make the dressing more impervious to air.

   b. *Foil and dressing.* In the absence of adhesive tape, use the first aid dressing of the type supplied to each individual soldier. Using aseptic technique, apply the plastic wrapper or the metal foil side of the waterproof paper wrapper of the first aid dressing directly over the (fig. 8–29). Apply the wrapper forcibly as the patient exhales. If the patient is conscious, have him exhale forcibly and hold his breath while you seal the wound. Apply the cotton dressing over the wrapper and exert manual pressure evenly with the open hand. Anchor the dressing in place with the dressing tails. Tie additional bandaging material around the patient's chest and over the dressing so that firm, even pressure is maintained over the wound, wrapper, and dressing.

2. *Assure an open airway.* Allow the conscious patient to sit, lean backward, or lie on the injured side to ease pain and breathing. Encourage the patient with respiratory difficulty to cough up airway obstruction despite the pain that coughing may produce at the

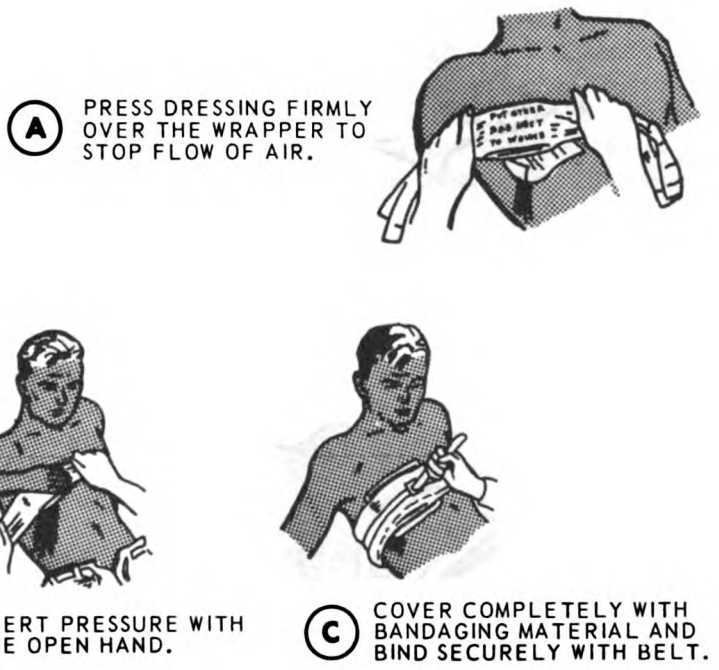

A
PRESS DRESSING FIRMLY OVER THE WRAPPER TO STOP FLOW OF AIR.
B
EXERT PRESSURE WITH THE OPEN HAND.
C
COVER COMPLETELY WITH BANDAGING MATERIAL AND BIND SECURELY WITH BELT.

Figure 8–29. Sealing pneumothorax.

wound site. Place the patient who is unconscious or in shock in the semiprone position (fig. 8–13) with the injured side down. Cleanse his mouth periodically as necessary to permit free passage of air. If nonsurgical means fail to assure a patent airway in the patient with a chest wound, surgical airway and prompt suction (para 8–6 through 8–8) are indicated.

3. *Prevent or treat shock.* Prevent or treat shock with general measures (para 8–16) except—

- Do not use the head-low position.
- Do not give morphine.
- Give necessary intravenous fluids slowly and with care to avoid embarrassing the already impaired respiration. Give preference to reconstituted serum albumin (para 8–18*b*) as the initial volume replacement fluid.
- Do not give oral fluids until you know that there is NO associated wound of the esophagus or abdomen. If the wound is below the nipple area or if a missile wound of the thorax has no associated wound through which the missile made its exit, an abdominal wound is a possibility.

8–48. Abdominal Wounds and Their Evaluation

Patients with abdominal wounds, viewed as a group, stand a poor chance of recovery in the emergency medical situation. Most abdominal wounds are grossly contaminated by the contents of the gastrointestinal or urinary tracts. Patients with abdominal wounds require prompt surgery. Surgery is the only acceptable medical means for stopping hemorrhage within the abdominal cavity. Abdominal surgery of trauma places a heavy drain on professional time and on medical supplies such as replacement fluids that would deny these capabilities to other patients less gravely injured. Consequently, performance of abdominal surgery is not anticipated in the emergency medical treatment situation. Moreover, resuscitating these patients before surgery is contemplated constitutes a waste, even if the patient responds adequately, because his condition is almost certain to deteriorate thereafter and make him less likely to withstand anesthesia and surgery later. Immediate attention given these patients is more of a supportive than a treatment nature. With supportive care, some of them will stabilize on their own and live to survive surgery. Others will die despite the most heroic efforts that might be made to save them. Still others will die because massive resuscitation and prompt surgery are not done.

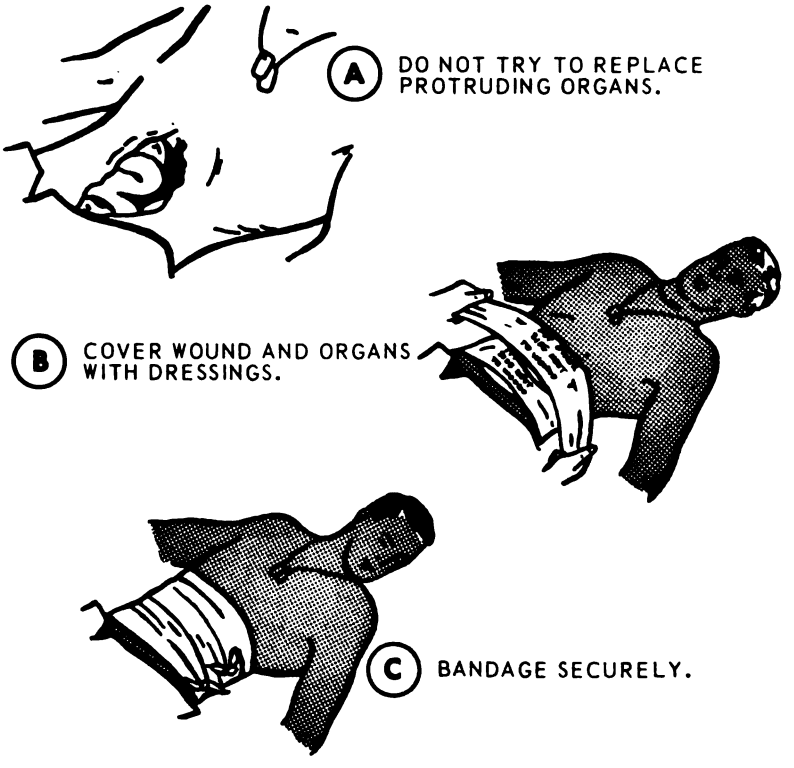


Figure 8–30. Emergency medical care for abdominal wound.

Each death in this last group must be accepted as part of the price for saving life and function for many other patients less gravely injured.

EMERGENCY MEDICAL CARE FOR ABDOMINAL WOUND

1. *Dress wound.* Cover with one or more sterile dry dressings to prevent further contamination (fig. 8–30). Do not touch or try to push protruding organs into the wound; however, if it is necessary to move an exposed intestine onto the abdomen in order to cover the wound adequately, then do so. Secure the dressing in place with the dressing tails and additional bandage. Since internal bleeding cannot be controlled by pressure and excessive pressure can cause further injury, do not bandage the wound tightly.

2. *Lessen shock.* Leave the patient on his back, but turn his head to one side since he will probably vomit. Watch him closely to prevent him from choking. If he is on a litter, raise the foot of the litter 6 inches. Keep him comfortably warm. Give morphine intramuscularly while the pulse is still strong, but not after it has become weak or thready. Permit nothing by mouth, but occasionally moisten his lips with a wet cloth to help alleviate thirst. Give glucose intravenously, if it can be spared, for nutrition and hydration. Prescribed doses of antibiotics may also be given intravenously if they can be spared.

Section XI. POISONS

8–49. Poisons and Their Effects

a. Term Explained. A poison is a substance which may cause death, serious illness, or some other harmful effect when it is introduced into the body in a relatively small quantity.

b. Effects. The effects of poisons may be local or remote; some poisons have both.

(1) *Local effect.* Local effect means direct action on the part to which the poison is applied, such as corrosion or irritation of the skin.

(2) *Remote effect.* Remote effect means that the action of the poison is on some organ remote from the seat of application or point of introduction.

(3) *Cumulative effect.* Sometimes a poison shows no effect—or only a slight one—until several doses of it have been taken; then an effect is suddenly produced which nearly equals that produced when the whole amount is taken at once. This is known as cumulative effect.

(4) *Factors influencing effects.* The effect of a poison depends upon its solubility, the way that it is introduced into the body, and the rapidity of its absorption into the system. The method of introduction may determine its toxicity altogether. *For example,* snake venom is not usually harmful when it is swallowed but is extremely poisonous when injected hypodermically.

8–50. Route of Entry

There are various ways in which poisons may be introduced into the body; the most common methods are by mouth, inhalation, and injection.

a. By Mouth. Poisons taken by mouth enter the circulation by absorption through the stomach and intestines.

b. By Inhalation. Poisons inhaled enter the circulation by absorption from the air passages and lungs.

c. By Injection. Poisons introduced by hypodermic injection or by injection into the uethral, rectal, or vaginal orifices enter the circulation through absorption from body tissues. Poisons injected intravenously are introduced directly into the bloodstream. Poisons may also be introduced by applying them to open wounds and to unbroken skin. After entering the circulation, a poison is carried by the blood to the tissues and organs susceptible to its action and attacks them.

8–51. Excretion

Most of the excretion of poisons in the body takes place in the kidneys, lungs, liver, GI tract, skin, and salivary glands. Poisons may be excreted from the system unchanged or in the form of other compounds into whch they have been transformed by the action of various body organs and tissues. The most damaging effects of some poisons are found at the points of excretion, as in the kidneys and colon in poisoning by mercuric chloride (bichloride of mercury).

8–52. Conditions Modifying Poison Effects

Various conditions of a person may modify the

actions or effects of poisons on his body, just as they modify the action and dosages of drugs used therapeutically. These include age, idiosyncrasy, disease, habituation, and tolerance.

8-53. Acute Versus Chronic Poisoning

Poisoning may be either acute or chronic.

a. Acute Poisoning. Acute poisoning is the condition brought on by taking an overdose of poison.

b. Chronic Poisoning. Chronic poisoning is the condition brought on by taking repeated doses of a poison or as a result of the absorption of poison over a long period. Matchmakers, painters, and wallpaper-hangers are members of occupational groups which are subject to chronic poisoning from phosphorus, mercury, lead, and arsenic, respectively.

8-54. Classification

a. Gaseous and Aerosol Poisons. These poisons are present in the gaseous state and, if inhaled, destroy the capability of the blood as a carrier of oxygen and/or irritate or destroy the tissues of the air passages and the lungs. When they are in contact with the skin and mucous membranes, these poisons may produce lacrimation (tears), vesication (blisters), inflammation, and congestion. Examples are carbon monoxide, carbon dioxide, nitrous oxide (laughing gas), nitric acid, ammonia gas, chlorine gas, bromine vapos, and casualty-producing chemical agents.

b. Inorganic Poisons. Inorganic poisons fall into two classes—

(1) *Corrosives.* Corrosives are substances which rapidly destroy or decompose the body tissues at the point of contact. Some examples are hydrochloric acid; nitric acid; sulphuric acid, in concentrated form; phenol; oxalic acid; glacial acetic acid; sodium hydroxide; potassium hydroxide; and iodine.

(2) *Metals and their salts.* Metals and metallic salts are corrosives that irritate locally but are most toxic when they are absorbed and damage internal organs, especially those of excretion. Some examples of metallic poisons are arsenic, mercury antimony, bismuth, copper, iron, lead, tin, and radioactive substances.

c. Alkaloidal Poisons. These poisons are plant principles which produce their chief action on some part of the nervous system. Some examples are atropine, cocaine, morphine, physostigmine (eserine), and strychnine.

d. Nonalkaloidal Poisons. These poisons include various chemical compounds. Some of these poisons, obtained from plants, have hypnotic, neurotic, irritant, and systemic effects. Some examples are the barbiturates, salicylates, trinitrotoluene (TNT), acetophenetidin, cantharrides, castor oil, turpentine, and aspirin.

e. Food Poisons. Food poisoning is caused by the ingestion of amino compounds which result from decomposition of protein or dead animal matter, or toxins produced by various bacteria.

8-55. Effects and Symptoms

a. Corrosives. Corrosives are substances which rapidly destroy or decompose the body tissues at the point of contact. The general symptoms of corrosive poisoning include an immediate burning pain in the throat, mouth, and stomach, followed by retching and vomiting; the stomach contents are mixed with dark-colored liquid and shreds of mucous membrane from the stomach, esophagus, and mouth. The inside of the mouth is corroded and the lips present a characteristic stain if an acid is the offender. Swallowing is very difficult (dysphagia), respiration is impeded (dyspnea), the abdomen is tender and distended with gas, the temperature is high, and the facial expression shows anxiety and great suffering.

b. Irritants. Irritant poisons are those which do not directly destroy the body tissues but set up an inflammatory process at the site of application or contact. Some examples are potassium nitrate, zinc chloride, zinc sulfate, ferrous sulfate, silver nitrate, arsenic, iodine, and phosphorus. The general symptoms of poisoning by the irritants are nausea, vomiting, and purging; frequently the vomited matter and stools contain blood, and there may be pain and cramps in the abdomen. Sometimes the urinary tract is inflamed.

c. Neurotoxics. Neurotoxics are poisons which act on the brain and spinal cord. Some examples are opium, hydrocyanic acid (prussic acid), ether, chloroform, aconite, nux vomica, belladonna, ethyl and methyl alcohol, and the barbiturates. The general symptoms may be—depending upon the effects of the offending agent—symptoms of either stimulants or depressants in the central nervous system.

(1) *Depressants.* Depressants may produce a short period of exhilaration followed by drowsiness and stupor; slow pulse; slow and stertorous breathing; cold, clammy skin; cyanosis (a bluish discoloration of the skin due to lack of oxygen in

the tissues); muscular relaxation; dilated or contracted pupils; and insensibility to external impressions.

(2) *Stimulants.* The stimulants or excitants produce symptoms characterized by rapid and feeble pulse; delirium; hot and dry skin; a sense of suffocation and an inability to breathe; shuddering and jerking of the muscles; dilated or contracted pupils; disordered vision; and sometimes convulsions and tetany (as in the case of strychnine poisoning).

d. Gaseous Poisons. The effects of these poisons have already been discussed in paragraph 8–54*a*.

e. Food Poisoning. The term "food poisoning" is conventionall divided into two types: food intoxication and food infection.

(1) *Food intoxication.* Food intoxication is due to a specific toxin produced outside the body —*for example,* the toxin of botulism. Other organisms cause food intoxication by producing toxins. These toxins are formed under suitable conditions, usually by staphylococci, occasionally by streptococci, and rarely by coliform and proteus groups.

(2) *Food infection.* Food infection is usually caused by a specific group of organisms; namely, the Salmonella group.

(3) *General symptoms.* GI distress, nausea, vomiting, diarrhea, urticaria (formation of raised patches on the skin which itch intensely), and circulatory and nervous disturbances are the general symptoms of food poisoning. They may vary from mild discomfort to violent disturbances of the normal functions of the body. In more acute forms, the neurologic symptoms may overshadow the GI symptoms and be followed by collapse. Death is usually due to respiratory paralysis, cardiac failure, or secondary pneumonia.

8–56. Treatment of Poisoning

a. Poison Control Centers. The US Public Health Service has established a clearing house for poison information. Its chief purpose is to interchange information with the many local control centers established throughout the country. These poison control centers have been established at major medical centers and operate on a 24-hour basis. Every medical facility should try to use the services of the nearest poison control center.

b. Basic Procedures.

WARNING

If there is any possibility of getting a doctor, get him immediately.

The rudimentary procedures in the treatment of poisoning are to—

(1) Get the bulk of the poison out of the stomach quickly. Remove with emetics (agents which induce vomiting) or lavage (wash out) the stomach with a stomach tube when not contraindicated.

(2) Administer an antidote for the poison that's left in the stomach.

(3) Eliminate from the system the poison which has been absorbed.

(4) Treat symptoms as they arise.

(5) Take possession of all goods, medicines, vomited matter, feces, urine, and anything else that may be of value in determining the identity of the poison, whether it was taken accidentally, intentionally, or was criminally administered.

c. Unknown Poisons. For the purpose of general treatment, a case involving unknown poisons may be considered to be either of two kinds: it may be a case in which the local effects of the poison have injured the mucous lining of the mouth, esophagus, and stomach to an extent contraindicating the use of instruments or emetics to evacuate the stomach; or it may be a case in which the poison has little or no effect on the mucous lining of the alimentary tract and, therefore, one in which it would be safe to use a stomach tube or an emetic.

(1) *Poisons injuring the alimentary tract.* Poisons coming under the classification of corrosives generally injure the mouth, esophagus, and stomach when they are ingested. Naturally, in cases involving poisoning by these agents, the introduction of any sort of instrument, even a soft rubber stomach tube, may perforate the weakened wall. In such cases, the stomach may even be perforated or ruptured by emetics.

(2) *Poisons not injuring the alimentary tract.* Poisons classified as irritants and neurotoxics generally have no special local or injurious action on mucous membranes of the mouth and stomach, and therefore in poisonings by these agents, the stomach may be evacuated and washed out with the aid of the stomach tube; or if no stomach tube is available, emetics may be used with little fear of injury.

d. Determining Whether the Poison is Corro-

sive or Not. Even when the exact nature of the poison is unknown, it is usually not difficult to determine whether the effects of the material are corrosive or not.

(1) *Corrosives.* A corrosive poison leaves unmistakable signs about the lips and mouth. When the local condition points to a corrosive poison, the evidence also usually indicates whether it is acid (para 8-55*a*) or alkali. Neither the stomach tube nor the emetic can be used for either type.

(2) *Noncorrosives.* When no signs of injury to the lining of the mouth appear, the poison is probably one of the irritants or the neurotoxics; that is, it may be a salt of one of the noncorrosive poisonous metals; it may be one of the alkaloidal drugs such as opium, belladonna, or nux vomica; or it may be morphine, codeine, cocaine, atropine, and strychnine. The patient may be suffering from poisoning by one of the drugs known as glycosides, of which the active principles of digitalis are examples; or he may have been poisoned by grain alcohol, wood alcohol, chloral hydrate, cyanide, phosphorus, iodine (which leaves stains on the lips) or phenol (the undiluted form has corrosive action), or barbiturates.

e. Universal Antidote.

NOTE

For many years the universal antidote, the formula appearing below, was thought to be a shotgun preparation that would precipitate certain chemicals, combine with others to reduce their toxicity, or in some cases render poisons completely innocuous.

Activated charcoal ---------- 2 parts
Magnesium oxide ---------- 1 part
Tanic acid ---------- 1 part

More recently authorities have ascertained activated charcoal alone is a better universal antidote. The dose of activated charcoal is 10 to 50 Gm. in approximately 400 ml. of warm water; this is used to absorb or neutralize poisons. Activated charcoal is useful for poisoning by all substances except cyanides. It should be followed by gastric lavage or an emetic except when corrosive substances are involved.

f. Steps in Emergency Care. Emergency treatment and action should, in general, conform with the following steps:

(1) Determine the identity of the poison by symptoms, history, residue in glasses, and other related sources of information. Check for antidotes (table 8-3).

(2) Wash the stomach with lukewarm water or saline solution between doses of the antidote. Repeat this treatment at 10-minute intervals as long as seems necessary. After washing out the stomach, and between doses of antidote, give the patient a thin paste of starch, the white of two eggs, or other albuminous substances.

(3) Always use the stomach tube unless it is contraindicated, as in cases when strong alkalis, acids, corrosives, or strychnine are suspected, or when the patient is comatose. The stomach tube facilitates administering antidotes as well as washing out the stomach at short and frequent intervals. It makes it possible to handle the case in a positive manner insofar as it places the administration of the emergency treatment under control.

(4) When it is not possible to employ the stomach tube, antidotes must be taken by mouth and removed by emesis; in some cases, emesis may be brought about by tickling the throat, but it more often requires the use of emetics.

Table 8-3. Poisons, Symptoms and Signs, and Antidotes

Poison	Symptoms and signs	Antidotes
ACETANILID	Cyanosis, due to formation of methemoglobin; vertigo; skin reactions; headache; mental confusion; weakness; desire to sleep; death from circulatory or respiratory collapse.	Gastric lavage or emetic if swallowed. Artificial respiration; oxygen.
ACETONE	Heavy inhalation or ingestion results in decreased respiration, pulse and temperature; stupor, and in extreme cases, death.	See Alcohol, Methyl.

Table 8-3. Poisons, Symptoms and Signs, and Antidotes—Continued

Poison	Symptoms and signs	Antidotes
ACIDS Hydrochloric Nitric Sulfuric Acetic Phosphoric Oxalic	Lips, mouth, tongue, and throat burned (dark-brown or black by hydrochloric and sulfuric acid, yellowish green to orange by nitric acid, brownish by acetic and oxalic acids); burning pain and destruction of tissues in mouth, throat, and stomach; vomiting; feeble pulse; difficult speaking and swallowing; cold clammy skin; shock; perhaps convulsions and coma in oxalic acid poisoning; collapse. Possible yellow stains on clothing in hydrochloric acid, and dark brown to red in oxalic acid poisoning.	Avoid stomach tube and emetics. Administer alkalis (magnesia, lime water, soap in copious amounts of water, and demulcents (white of egg, milk). General stimulants, external heat. Morphine (15 mg.) for pain. Oxalic acid: never use stomach pump; induce vomiting immediately; give a dilute solution of any form of lime (plaster from wall) at once. Avoid salts of sodium and potassium. External heat. Ammonia.
Phenols Carbolic Acid Creosote Cresol (Lysol) Guaiacol	White burns about mouth, lips, tongue and throat. Burning pain in the mouth, throat, and stomach; vomiting (vomitus and breath reek with characteristic odor); headache; cyanotic or pale face; contracted pupils; rapid pulse; irregular, stertorous breathing; muscular weakness; subnormal temperature; patient rapidly becomes comatose, collapse.	Use stomach tube cautiously; lavage with sodium or magnesium sulfate, lime water, soap; and give demulcents (olive oil, preferably, milk, or egg white). Avoid mineral oil, alcohol or glycerin. Artificial respiration, oxygen; ammonia. Phenol may be removed locally by washing with alcohol.
Acetylsalicyclic Acid	See Salicylates.	
Hydrocyanic Acid (Prussic)	See Cyanides.	
ACONITE [2] Aconitine	Pallor; salivation; tingling and numbness in mouth and fingers; burning in throat and stomach; nausea and vomiting; slow feeble and irregular pulse; rapid and shallow respiration; muscular weakness; cold clammy skin; difficult swallowing; impaired voice; cramps in extremities and possible tetanic convulsions; death from cardiac or respiratory paralysis.	Avoid emetics. With stomach tube, lavage with tannic acid. Give tea, strong coffee. Stimulate with inhalation of aromatic ammonia. Use artificial respiration, oxygen.
ALCOHOL Methyl	Initially: dizziness, headache; nausea and vomiting; dimness of vision, with defogging of the brain. Later: widely dilated pupils with ultimate blindness; weakened circulation; stupor; coma; delirium; convulsions; cold, clammy skin; subnormal temperature; death from paralysis of respiratory center.	Wash out stomach repeatedly with sodium bicarbonate (1 to 3%) solution, large volumes of fluid. Purgatives. Caffeine for stimulation. Combat acidosis with fluids, alkalis, and sodium lactate.
Ethyl and Isopropyl	Exhilaration; staggering gait; deep sleep with stertorous breathing; acute gastritis and profound depression. Delirium tremens frequently occurs after an alcoholic debauch.	Wash out stomach. Keep body warm, head cold. Carbon dioxide and oxygen. A barbiturate if patient is violent.
ALDEHYDES Formaldehyde (Formalin)	Intense irritation of the eyes, respiratory tract and mucous membranes of mouth, throat, and intestinal tract; vomiting and diarrhea; central nervous system depression; vertigo; coma. Severe acidosis may result.	Wash out stomach with dilute ammonia and ammonium acetate. Give egg white or milk, then gastric lavage with 0.1% ammonia water or emetic. Oxygen.
ALKALIS Lye Caustic Soda Potash Ammonia Lime	Strong soapy taste in mouth. Severe burning pain in mouth, throat and stomach. Early violent vomiting with blood and mucus in vomitus. Mucous membranes become swollen and white; lips and tongue swell; throat may become constructed. Respiration difficult; skin cold and clammy; Pulse rapid; violent purging. Great anxiety.	Avoid stomach tube and emetics; neutralize with weak solution of acid (vinegar, lemon juice or grapefruit juice). Give milk, egg white or other demulcents. In surface burns, wash with large amounts of cold water; burns on eye, with boric acid solution.
AMYL NITRITE	See Nitrites.	

Table 8–3. Poisons, Symptoms and Signs, and Antidotes—Continued

Poison	Symptoms and signs	Antidotes
ANESTHETICS Chloroform Ether	General central nervous system depression.	Maintain free airway. If drug swallowed, evacuate stomach; wash out with sodium bicarbonate solution and give demulcents. Administer 95% oxygen with 5% carbon dioxide, use respirator.
ANILINE	See Acetanilid.	
ANTIMONY	Very similar to arsenic; shock is outstanding feature of acute antimony poisoning.	Gastric lavage with warm tannic acid solution or tea. Give dimercaprol as in arsenic poisoning. (See Arsenic.) Give demulcents (milk, egg white) or magnesium oxide. External heat.
ANTIPYRINE Aminopyrine	Skin eruptions; excitement; delirium; convulsions. Agranulocytosis; fever; malaise; throat ulceration.	See Acetanilid.
ARSENIC Arsenious Acid Fowler's Solution Paris Green	Faintness and depression come on in about one-half hour; intense pain in the region of the stomach; tenderness of abdomen on slight pressure; nausea and vomiting increase by every act of swallowing; purging, bloody stools; cold, clammy skin; feeble, rapid pulse.	Gastric lavage with warm water. Salines followed by castor oil. Give dimercaprol (BAL, British Anti-Lewisite) in doses of 3 mg. per kg. of body weight by IV injection every 4 hours.
ATROPINE	See Belladonna and derivatives.	
BARBITURATES Barbital Phenobarbital Other Barbituric Acid derivatives	Respiration shallow and slow; weak rapid pulse; fall in body temperature; moist, cold, cyanotic skin; stupor, coma, general nervous system depression.	Evacuate stomach, large volumes of fluid. Magnesium sulfate purge, and diurtics. Ammonia. Apply external heat.
BARIUM (Soluble Salts)	Powerful muscular stimulation; vomiting, severe colic and diarrhea; hemorrhage; death usually results in a short time.	Evacuate stomach; lavage with magnesium or sodium sulfate solution, follow with milk or other demulcents.
BELLADONNA GROUP Atropine Hyoacyamine Stramonium Scopolamine	Redness or rash of the skin, skin hot and dry; nose, throat and bronchi dry; voice hoarse; swallowing difficult; pulse full and bounding, later feeble and rapid; pupils dilated, vision disordered; pre-disposition to laugh and talk loudly. There may be wild and maniacal delirium, or mental depression; suppression of the urine; convulsions. Death usually occurs from asphyxia.	Gastric lavage with tannic acid solution or emetic. Hot and cold application.
BENZENE (Benzol)	See Solvents.	
BENZIN	See Petroleum.	
BROMIDES	Chronic: dermatitis; mental dullness, apathy, mental and neurologic disturbances; nausea.	Discontinue drug; give sodium chloride by mouth, 4 to 10 grams daily, to hasten excretion. Fluids. Oxygen. Calm with barbiturates, normal doses.
BROMINE	See Chlorine.	
CANNABIS (Marijuana)	Mental confusion involving exhilaration and depression; hallucinations, delirium, mania; drowsiness; muscular weakness; dilated pupils; rapid pulse; slow respiration; convulsions.	Evacuate stomach; give tannic acid (strong tea) solution. Ammonia; oxygen; artificial respiration.
CARBOLIC ACID	See Acids, Phenols.	
CARBON DIOXIDE GAS	See Gases.	
CARBON MONOXIDE GAS	See Gases.	
CARBON TETRACHLORIDE Cleaning Fluids.	See Solvents.	

Table 8-3. Poisons, Symptoms and Signs, and Antidotes—Continued

Poison	Symptoms and signs	Antidotes
CHLORAL HYDRATE	Deep stupor; marked vasodilation; low blood pressure; fall in body temperature; slow respiration; cyanosis.	Evacuate stomach and wash out with tea or coffee. Apply external heat. Artificial respiration.
CHLORINE Bromine Chlorinated Lime Chlorine Water	Irritant gases produce irritation and corrosion of the respiratory tract causing bronchitis, which may be more or less severe. Irritation of the eyes, mouth, stomach, and kidneys also result.	By inhalation.—Remove patient from source of gas; give inhalations of ammonia and begin artificial respiration at once. By mouth.—Gastric lavage with boiled starch or albumin solutions. When respiration is established give magnesium oxide or dilute alkalis. Treat also as for bromide poisoning.
CHLORDANE	See DDT.	
CHLOROFORM COCAINE AND SUBSTITUTES	See Anesthetics. Dilated pupils; talkativeness; sweating; restlessness, excitement, delirium, hallucinations, mania, followed by depression; nausea, vomiting; numbness and tingling in hands; headache, dizziness; small, rapid pulse; irregular respiration; later, convulsions, collapse, cyanosis, shock, possibly death from respiratory failure.	If drug was taken by mouth, give tannic acid (strong tea) solution, then remove with stomach tube. For fainting, inhalations of aromatic spirts of ammonia or, orally, 1 teaspoonful in water. Artificial respiration and oxygen. CAUTION: Avoid morphine.
CODEINE	See Opium.	
COPPER SALTS Copper Sulfate (Blue Vitriol) Acetoarsenite	Copper taste in mouth; astringent action on throat; vomiting, thirst and purging with greenish stools; severe abdominal pain; tetanic spasms; delirium; paralysis; collapse.	Empty stomach by lavage of 5% solution of sodium thiosulfate. Give demulcents and magnesia. Apply external heat. Stimulants.
CROTON OIL	Severe gastroenteritis.	Evacuate stomach; follow with demulcents. Stimulate with ammonia.
CYANIDES Hydrocyanic Acid (Prussic Acid) (Fumigating Gas) Bitter Almond Oil Chokeberries	With large doses death is almost instantaneous. With small doses the victim may present cyanotic face; clenched teeth; open and staring eyes; perhaps bloody froth on lips; slow, labored, and gasping respiration; slow pulse; disturbed mental activity; dilated pupils; vomiting; general convulsions with involuntary defecation and urination; coma, followed by death from paralysis of respiratory center. Odor of bitter almond on breath.	Get in touch with doctor or nurse. 1. Prepare syringe with 10 ml. (0.3 gram) sodium nitrite while assistant No. 1 washes out stomach and assistant No. 2 gives amyl nitrite by inhalation (once every 3 minutes). 2. Inject sodium nitrite IV while assistant No. 2 discontinues amyl nitrite inhalation and prepares 50 ml. syringe with sodium thiosulfate (12.5 grams in 50 ml.). 3. Inject 50 ml. of thiosulfate solution IV while more amyl nitrite is given if needed. If relapse occurs, repeat treatment, using one-half these amounts. If nitrite shock occurs, give epinephrine, 1:1,000 solution. NOTE: Give oxygen.
DDT (CHLORINATED ORGANIC INSECTICIDE) DDT (Dichloro-Diphenyl-Trichloroethane) TDE (Tetrachloro-Diphenylethane) Chlordane	Sensory disturbances, staggering gait; nausea; vertigo; headache; cold, clammy skin; numbness and partial paralysis of extremities; delirium; convulsions; respiratory arrest.	Emetics or gastric lavage, saline laxatives. Avoid oily laxatives. Short-acting barbiturates for convulsions. Quiet and rest. Adequate fluid intake.
DIGITALIS Digitoxin Digoxin Lanatoside C Red Squill	Pulse slow and full, then rapid and irregular; nausea, persistent vomiting, colic, and purging; thirst; vertigo and disturbances of vision and hearing; headache; muscular weakness; respiration rapid and feeble; cyanotic skin; coma and convulsions. Death occurs from cardiac paralysis.	Tannic-acid (strong tea) solution lavage; magnesium sulfate; ammonia. Horizontal position even after improvement, as exertion may prove fatal.

Table 8-3. Poisons, Symptoms and Signs, and Antidotes—Continued

Poison	Symptoms and signs	Antidotes
ERGOT AND DERIVATIVES	Vomiting, diarrhea, unquenchable thirst; itching, tingling, coldness of skin; weak and rapid pulse; disturbed vision; confusion and unconsciousness.	Repeated gastric lavage; purgation with magnesium sulfate (15 grams). Amyl nitrite (0.3 ml.).
ESERINE	See Physostigmine.	
ETHER	See Anesthetics.	
FORMALDEHYDE	See Aldehydes.	
FOOD POISONING	Sudden onset of nausea followed by vomiting, abdominal cramps and diarrhea (blood and mucus present in severe cases). Severe vomiting, and diarrhea may result in dehydration and shock. Headache and muscle and nervous irritability may be prominent. Death may occur from respiratory paralysis or secondary pneumonia.	No fluids by mouth as long as nausea and vomiting persist. If diarrhea persists after 24 hours, paregoric 2 teaspoonsful every 4 hours. CAUTION: Avoid morphine.
GASES Carbon Dioxide	Headache, dizziness; dyspnea; irritation of nasal passages; palpitation; mental clouding; dimness of vision; muscle tremor; tingling; cold extremities; mental depressions; fall in blood pressure; coma, generally without convulsions.	Remove from foul atmosphere; give oxygen, fresh air; apply friction and heat to extremities. Stimulants if necessary. Artificial respiration. Maintain treatment continuously if recovery has occurred after a long period of unconsciousness.
Carbon Monoxide	Headache, dizziness; weakness; nausea and vomiting; swooning or collapse; increased respiration and pulse. (All of these symptoms may be absent before unconsciousness.)	Remove patient from foul atmosphere; give pure oxygen, fresh air (avoid chilling). Keep patient warm and quiet. Artificial respiration, rest.
Irritant Gases	See Chlorine.	
HYOSCYAMINE	See Belladonna Group.	
INSECTICIDES	See DDT.	
IODINE	Acid taste in mouth; pain and sense of great warmth in throat; severe pain in esophagus, stomach, and abdomen with violent vomiting and purging (vomitus may contain traces of iodine). Lips and oral mucous membranes corroded and stained a dark brown; intense thirst; rapid, feeble pulse; face pale; suppression of urine; convulsive movements and collapse.	Gastric lavage with solution of soluble starch or flour, or 1 to 5% sodium thiosulfate solution. Demulcents. Stimulants. Give abundant fluids.
LAUDANUM	See Opium.	
LEAD SALTS Lead Acetate White Lead	A sense of constriction about the throat; sweetish, metallic taste in mouth; cramps; stiffness of abdominal muscles; blue line around the gums; paralysis of upper extremities; dropped wrist; vomiting of white flaky matter and constipation.	Give 4 or 5 grams sodium citrate dissolved in 30 ml. of water, 3 or 4 times daily by mouth, until lead excretion falls to normal. In acute poisoning by ingestion, evacuate stomach; give cathartics and demulcents.
MARIJUANA	See Cannabis.	
MERCURY Bichloride (Corrosive Sublimate) Merthiolate	Acrid metallic taste in mouth; salivation; thirst; burning pain in mouth, throat, and abdomen; nausea and vomiting of bloody material; straining to empty bowels or bladder; purging with mucus and blood in stools; suppression of urine; shock; and collapse. Face flushed; quick irregular pulse, cold extremities. Mucous membranes of lips, mouth, tongue, and throat may appear shriveled and white.	1. Administer 1 raw egg white in milk for every 4 grains of bichloride of mercury taken. 2. Wash out stomach with 5% solution of sodium formaldehyde sulfoxylate. Allow 6 or 7 oz. to remain (or use 1 gram of soidum hypophosphite, 10 ml. of water, and 5 ml. of hydrogen peroxide for each estimated 1½ grains of mercury bichloride taken). Lavage with diluted solution.

Table 8-3. Poisons, Symptoms and Signs, and Antidotes—Continued

Poison	Symptoms and signs	Antidotes
		3. Give dimercaprol (BAL, British Anti-Lewisite) IM as soon as possible in a dose of 5 mg./kg. body weight, follow in one or two hours with a dose of 2.5 m./hg., then give two more doses of 2.5 mg./kg. within the first 12 hours. 4. Maintain body fluids.
METHYL SALICYLATE (Oil of Wintergreen)	See Salicylates.	
MORPHINE	See Opium.	
MUSHROOMS, Poisonous Muscarine	Abdominal pain, vomiting, diarrhea; after 24 hours or more, cyanosis and cold, clammy skin, convulsions and coma. Excessive salivation, lacrimation; profuse sweating followed by violent retching, vomiting, diarrhea, dyspnea, confusion, hallucinations. Pupils are contracted but do not react to light and do not accommodate (diagnostically important).	Tannic acid (strong tea) and charcoal suspension; evacuate stomach; wash out with sodium or magnesium sulfate. Treat shock. Barbiturates to combat excitement.
NICOTINE (Black Leaf 40)	Burning sensation in upper gastrointestinal tract; salivation, nausea, vomiting, diarrhea; stimulation followed by paralysis of central nervous system.	Tannic acid (strong tea), gastric lavage, or emetics. Artificial respiration to counteract paralysis of respiratory muscles. Cold to head; external heat.
NITRITES Amyl Nitrite Nitroglycerin	Severe headache, drowsiness; vomiting, colicky pains, diarrhea; flushed face; dizziness; dyspnea; cyanosis; convulsions, delirium, coma; respiratory paralysis.	Gastric lavage and purgation by magnesium sulfate.
NUX VOMICA	See Strychnine.	
OPIUM Codeine Heroin Laudanum Morphine Paregoric	Usually there is a period of mental exhilaration and physical ease with quickened pulse. This is followed by dizziness, drowsiness, languor, and nausea; slow weakened pulse; slow stertorous breathing; cold clammy skin; cold extremities; muscular relaxation; cyanosis; livid countenance; pupils contracted (pinpoint) but may dilate just before death; insensibility to external impressions; deep sleep from which, if the patient is aroused, there will be an irresistible predisposition to go back to sleep. Death occurs by paralysis of the respiratory center.	Evacuate somach; lavage with potassium permanganate (1:100 solution). Subsequent doses, 2 grains in 4 oz. of water. Keep warm and awake. Inhalation of oxygen and 5% or 10% carbon dioxide is important. Artificial respiration or respirator; coffee. Empty bowels with saline cathartics.
OXALATES	See Acid, Oxalic.	
PETROLEUM Kerosene Gasoline Petroleum Benzin	When the fumes or vapors are inhaled there is first dizziness, nausea, vomiting, constriction of the throat, headache, staggering and trembling of the hands and arms (the so-called "naphtha jag") and later, partial or complete insensibility, slow respiration, weak and scarcely perceptible pulse, convulsions, and death. There is a tendency to mania during return to consciousness in cases recovering from the poisoning. If swallowed, there is shortness of breath, cyanosis, cold clammy skin, coma, and death.	When inhaled: Fresh air, no emetic, no stomach tube; otherwise as when swallowed. When swallowed: Gastric lavage or emetic, followed by washing the stomach with very dilute potassium permanganate solution, then with warm water. It is advisable to administer two ounces of a solution of magnesium sulfate before withdrawing the stomach tube. Symptomatic stimulation, oxygen, external heat, artificial respiration.
PHENOLS	See Acids.	

Table 8-3. Poisons, Symptoms and Signs, and Antidotes—Continued

Poison	Symptoms and signs	Antidotes
PHOSPHORUS Rat and Roach Paste Matches Fireworks	Gastric disturbances may not be present but generally are. These are manifested as nausea, thirst, abdominal pain, and vomiting material which is luminous in the dark, varying stupor and prostration.	Copious and repeated lavage with copper sulfate ½% solution, followed by potassium permanganate, 1:1,000; or dilute hydrogen peroxide. Give mucilaginous drinks and 50 grams magnesium sulfate. Oxygen inhalations. CAUTION: For several days avoid in diet all edible oils, fats, or substances containing them (e.g., milk), since these promote absorption of phosphorus.
PHYSOSTIGMINE (Eserine)	Vomiting, epigastric pain; dyspnea; giddiness; muscular weakness and twitching; pupillary contraction; sweating; salivation.	Gastric lavage with tannic acid (strong tea) solution. Emetics. Keep warm. Artificial respiration.
PICROTOXIN	Epigastric pain, nausea, vomiting, diarrhea, salivation; weakness; sweating; headache; coma; clonic convulsions at 2-minute intervals.	Wash out stomach freely with 0.1% potassium permanganate. Artificial respiration with oxygen and carbon dioxide.
PILOCARPINE	Salivation; lacrimation; sweating, and flushing of skin; pupillary contraction, visual disturbances in accommodation. Intestinal disturbances, persistent purging, nausea and vomiting; hallucinations; convulsions; cyanosis; respiratory collapse.	Gastric lavage with potassium permanganate, 0.1% solution. Ammonia; artificial respiration; oxygen.
POTASSIUM PERMANGANATE	Corrosive gastroenteritis with a brownish black incrustation of the mucous membrane. Sometimes acute pharyngitis and edema of the glottis.	Induce vomiting with emetics, or gastric lavage with dilute hydrogen peroxide (10 ml. of 3% hydrogen peroxide in 100 ml. water) if corrosion is not too severe. Demulcents (egg whites, oils). Combat collapse and shock.
RODENTICIDES Sodium Monofluoroacetate (1080, Ten Eighty) Warfarin	Epigastric pain, nausea and vomiting; difficulty in swallowing. cardiac weakness; dyspnea; sensory and motor disturbances; epileptoid manifestations; renal irritations; anemia; increased coagulability of blood; death from shock or, later, from acidosis. Widespread hemorrhages and reddish eruptions.	Immediate emesis and gastric lavage with lime water. Administration of substances capable of supplying acetate ions, choice drugs are monoacetin (glyceryl monoacetate), 2 to 4 grams/kg. of body weight, and a combination of sodium acetate and ethanol, 2 grams/kg. of each. Complete quiet and rest. Teaspoon of salt in glass of warm water and repeat until vomitus is clear. Vitamin K therapy is valuable up to a point (65 mg. repeated 3 times a day, followed by smaller doses until prothrombin time is normal). Keep patient quiet. Treat for shock if indicated.
SALICYLATES Acetylsalicylic Acid (Aspirin) Methyl Salicylate (Oil of Wintergreen) Sodium Salicylate Phenyl Salicylate (Salol)	Vomiting (wintergreen odor, if methyl salicylate is agent), inflammation of upper gastrointestinal tract and pain; rapid pulse and feeble, blood pressure low; pallor; ringing in ears; sweating; dimness of vision; confusion and mental dullness.	Gastric lavage with warm 5% sodium bicarbonate solution. Force fluids to increase urinary output. Artificial respiration or respiratory stimulants. Apply external heat. Keep patient quiet. Demulcents to relieve pain and irritation (avoid oils).
SCOPOLAMINE	See Belladonna Group.	
SILVER SALTS Argyrol Silver Nitrate	Throat and abdominal pain; vomiting and purging of black or blood-stained material. Vertigo; spasms; coma; shallow respiration; convulsions; circulatory collapse. Mouth and lips stained gray-white, then black.	Common salt and water, as lavage or emetic. Follow with eggs and milk.
SOLVENTS Benzene Benzol Toluol Xylol	Burning throat; skin irritation (exposed parts); flushing of face; cyanosis of extremities; dizziness; restlessness, excitement, delirium, hallucinations; fever; convulsions; coma.	If inhaled, fresh air and change of clothing if it is contaminated. If ingested, wash out stomach with warm water. Artificial respiration, oxygen and carbon dioxide.

Table 8-3. Poisons, Symptoms and Signs, and Antidotes—Continued

Poison	Symptoms and signs	Antidotes
Carbon Tetrachloride	Warmth in stomach; inebriation; hiccup; headache; dilated pupils; abdominal pain, nausea and vomiting, diarrhea; respiratory paralysis or cardiovascular collapse; convulsions; death.	Remove from vapor; or if ingested, wash out stomach with warm water. Respirator with oxygen and carbon dioxide, stimulate symptomatically. Saline cathartics. CAUTION: Aviod alcohol.
STRAMONIUM	See Atropine.	
STRYCHNINE Nux Vomica	A sense of suffocation and inability to breathe; shuddering and jerking of the muscles; sense of stiffness about the neck; twitching and jerking of lower limbs and quivering of entire body. Convulsions—the body becomes rigid and bent forward or backward, or to one side, resting on the heels and head only. The features assume a peculiar, stiff grin called risus sardonicus. During convulsions there is cyanosis; weak, rapid pulse; dilated pupils. Between convulsions there is general relaxation, sweating, weariness, drowsiness. Convulsions are induced by noise, drafts of air, jarring, or sudden, bright light. Patient remains conscious until the end and is fully aware of what goes on about him.	Administer short acting barbiturate IV pentobarbital sodium 0.3 gram with doctor or nurse's order. CAUTION: Do not use stomach tube until barbiturate has relieved convulsions. Gastric lavage with potassium permanganate (1 pint warm 1:1,000 solution), iodine (15 drops of tincture in ½ glass of water), or tannic acid solution (1 teaspoonful in ½ glass of hot water) or glass of strong tea. Remove immediately from stomach with tube. Horizontal position in darkness and absolute quiet. If convulsions recur, repeat slow IV injection of barbiturate on doctor's or nurse's orders only. Artificial respiration, oxygen.
TURPENTINE	Sensation of warmth; abdominal pain, vomiting and diarrhea; blood, scant urine (violet odor): incoordination; excitement, convulsions, coma; respiratory paralysis, death.	Empty and wash out stomach; demulcents (white of egg, milk, cream); symptomatic stimulation.
VERATRUM Veratrine	Symptoms similar to aconite poisoning except for redness of skin with intense itching; sweating; pupillary dilation; loss of vision; dyspnea. Death from respiratory paralysis or cardiac collapse.	Avoid emetics; wash out stomach with tannic acid (strong tea) solution and purge with magnesium sulfate. External heat, fresh air. Ammonia Artificial respiration, oxygen.
WARFARIN	See Rodenticides.	
ZINC SALTS Zinc Chloride Zinc Sulfate	Corrosion of gastrointestinal tract; salivation, difficulty in swallowing, metallic taste in mouth; bloody vomitus; purging and bloody fecal material; collapse and death.	Give tannic acid (strong tea) solution, evacuate stomach and wash with sodium bicarbonate solution, or lime water, soap, mucilaginous drinks, or milk. Apply external heat. Treat shock.

(5) After the stomach tube or emetics has removed the residual poison from the stomach, elimination may be accomplished by using such cathartics as saline cathartics or castor oil, or by colo-rectal irrigation. One ounce of 50 percent magnesium sulfate or 10 to 30 Gm. of sodium sulfate may be left in the stomach and a large quantity of water ingested. Magnesium sulfate or sodium sulfate is helpful in cleaning the lower part of the bowel. No oil should be given unless it is certain that the patient is not suffering from an oil-soluble poison such as phosphorous or phenol.

(6) When the stomach tube and emetics are contraindicated such as in poisoning by acids and alkalis, neutralize the caustic by using a weak solution of opposite reaction—milk of magnesia, lime water, or soap for acids; vinegar, lemon juice, grapefruit juice for alkalis. Then administer a demulcent such as milk or egg whites.

g. Symptomatic Treatment. No definite outline of treatment can be laid down for combating the possibilities that may arise from absorbed poisons. This part of the treatment is based upon the symptoms which the individual case presents. Shock is an important factor to be considered. Intravenous administration of sodium chloride injection or glucose is helpful in restoring fluid balance. Medication should be limited to drugs with physiologic action which the specialist clearly understands.

h. Emetics. Numerous drugs produce nausea and vomiting as reactions from overdosage, but

the number of those that may be used specifically to cause a patient to vomit is relatively small. Vomiting may be stimulated by stroking the throat with the finger or placing a tongue depressor far back in the mouth. These methods work well when the stomach is full of liquid. When an emetic is required, the following may be considered:

(1) One to three teaspoons of powdered mustard in a glass of warm water (seldom effective).

(2) Warm, soapy water (also has antidotal action for a number of metallic salts, principally mercuric chloride) (seldom effective).

(3) Warm, salty water; 15 Gm. of sodium chloride in a glass of warm water. (Use with caution as it may create toxicity itself.)

(4) Apomorphine hydrochloride—5 mg. injected subcutaneously (never in morphine poisonings).

(5) Syrup of ipecac—15 to 20 ml., followed by 1 to 2 glasses warm water (agent of choice for routine use).

8–57. Poisons, Symptoms and Signs, and Antidotes

A fast and convenient reference for toxic signs and symptoms and the antidotes recommended for many of the more common poisons is shown in table 8–4. The antidotes included are those that a specialist could administer if a doctor or a nurse were not present. Be able to use this information rapidly in an emergency situation.

8–58. Snakebite Treatment

a. Procedure.

(1) Within practical limits, achieve immediate, absolute immobilization of the affected part in a position that is lower than the level of the heart.

(2) If the bite is on an extremity, place an improvised, lightly constricting band such as a rubber band 2 to 4 inches closer to the heart than to the site of the bite. Place this constricting band tight enough to halt the flow of blood in superficial vessels but not tight enough to stop the pulse. (You should be able to insert a finger between the constricting band and the limb.)

(3) If swelling progresses up the extremity, remove band and reapply ahead of swelling.

(4) If at any time the victim stops breathing, give mouth-to-mouth resuscitation.

(5) If feasible, kill the biting reptile without damage to head. Save the entire snake for positive identification later.

(6) Reassure the victim. Do not give alcohol or stimulants.

(7) Move the victim to a medical facility as soon as possible, taking the dead snake with him when available.

b. Incision and Suction. Trained medical personnel may also—

(1) If less than 30 minutes have elapsed since the bite, make a linear (fine line) incision, no more than ½ inch in length, through each puncture wound parallel to the involved limb. (Do not make such incisions or suction on bites on the finger.) Avoid injury to nerves, tendons, and blood vessels. Do not use cruciate (cross-like) or multiple incisions.

(2) Apply suction. Once suction has begun, continue for 30 minutes. Never delay transportation to a medical facility, however, just to continue suction.

c. Giving of Antivenin. Not all bites from poisonous snakes require the administration of antivenin; therefore, its use in the hands of other than a physician should be approached with extreme caution. The specialist should follow these guidelines:

(1) In all cases where the patient will reach a physician within an hour of the bite, defer administration of antivenin.

(2) When severe envenomation has occurred and no physician is available, first conduct skin sensitivity tests on the victim. If there is no reaction, give the antivenin intramuscularly at a site other than the one where the bite occurred.

(3) If the biting snake is one of the pit vipers indigenous to the Western Hemisphere, do not give antivenin unless the area of erythema and edema surrounding the fang marks reaches 5 inches in diameter. Then, use Wyeth Polyvalent Crotalid Antivenin.

(4) If the biting snake is from other parts of the world, be sure that any antivenin used is specific for the species involved. Antivenin generally should not be given unless there is drooping of the eyelids, slurring of speech, hemorrhagic tendencies, and severe local swelling.

Section XII. HOSPITAL EMERGENCIES

8-59. General

An emergency in a hospital calls for quick action and the use of judgment. Experience has shown that people react to emergencies in different ways and that preventive training in possible emergency situations is the best way to assure the desired reaction. Through training, practice drills, and instruction, the hospital staff is prepared for an emergency. Each hospital issues its own regulation or SOP on emergency removal of patients and fire fighting, as no one procedure will work for all. In addition to the safety prevention measures discussed in paragraph 5-9, this section will cover only some general guidelines on actions to be taken during fires or other disasters.

8-60. Disasters Occurring Outside a Hospital

a. When disaster strikes outside the hospital, casualties may be brought in so rapidly that hospital functions are impaired. Each hospital must prepare its own blueprint for action. This plan must be simple, yet flexible. Some of the things that must be considered include—

- Notification of hospital personnel both on- and off-duty. A checklist of people to be called should be near the telephone switchboard or near the telephone of the person responsible for calling. Consideration must be given to the fact that it might be impossible for one operator to call all personnel. Some hospitals utilize the pyramidal method of notifying personnel; for example, the chief nurse, upon notification, would call the supervisor; the supervisor would call the head nurse within her scope of responsibility, and so on. Many people use the phone unnecessarily during such times, so it may be necessary to send radio messages though such facilities as police or fire departments.
- Rapid screening of casualties—triage.
- A relatively simple system of record taking.
- A casualty list.
- Provision for release of patients who have been treated and are able to leave.
- A central information center for all disaster information.
- A system of traffic control. Guards should be posted to direct people to the information center.
- Controlled, yet readily available supplies. A box or footlocker may be of value for easy transportation of supplies.
- A place for relatives and friends who must be kept informed. Preferably this should be outside the hospital.

b. Plans should be tested by a mock disaster. Then, the plan adopted should be practiced regularly and often.

8-61. Emergency Within a Hospital

a. Administrative Measures.

(1) *Fire.* Each patient care facility normally designates a fire marshal who is responsible for overall supervision of its fire plan. He may also be the one in charge during any other type of disaster. He conducts fire inspections and issues instructions on reporting a fire, evacuation of the building, and location of fire hoses and extinguishers. These plans and evacuation routes are posted prominently on bulletin boards. The fire marshal should issue first aid firefighting instructions covering the equipment available.

(2) *Other disasters.* Explosions can occur; floods can cause electrical power and gas supplies to fail; the water supply can become contaminated. Emergency planning must include methods of obtaining potable water for drinking and safe water for many other hospital uses. Ways must be found to keep the hospital operating if at all possible.

b. Responsibility of the Individual. When disaster strikes, the specialist must act quickly and firmly. The lives of his patients are often in his hands. Above all, he must avoid panic and strive to prevent it among his patients. He must assure helpless patients that he is there and that help is coming. What he does depends upon the nature of the emergency, the help available, and the condition of the patients. If it is a fire, he reports it immediately, if possible. If the fire is in the room with a patient, however, his first step is to remove the patient from immediate danger. If a senior individual is present, he follows his orders promptly and calmly. If in charge, he sees to it that certain safety measures are taken, such as attempting to extinguish the fire with any appropriate firefighting equipment available, closing doors and windows, discontinuing all electrical appliances except the lights, alerting personnel in adjoining rooms and buildings, and assisting in the orderly evacuation of the building when necessary. All of these things are a matter of judgment; he is there and he must decide what will be

done and in what sequence. This is where regular and efficient safety training pays off.

c. General Rules for Evacuation.

(1) Upon notice that an emergency exists, ward personnel are usually required to return to their place of duty and to maintain order until directed to evacuate wards.

(2) Evacuation is usually made only on order of the hospital commander, the fire marshal, or other responsible individual. However, the situation may be so grave as to demand immediate action. In that event, the ranking officer or NCO in the area assumes charge.

(3) Priority and routing of evacuation should be directed by the fire chief or other responsible individual. Order must be maintained and evaucation controlled to prevent disastrous congestion in elevators or stairways. Normally, buildings are evacuated beginning at the top floor and working downward to the basement; however, if a ward or section is in immediate danger, it is evacuated first.

(4) Usually the ward officer or the ward nurse, aided by the wardmaster and other personnel, is responsible for the safe and orderly evacuation of patients on the ward. If elevators are present, the fire marshal or other responsible individual directs their operation. These elevators are usually reserved for wheelchair and stretcher cases. Wheelchair patients may use their chairs for transportation. The ward officer designates litter patients for whom evacuation by elevator is deemed essential. Sometimes bedfast patients may be moved easier in their beds if doorways are wide enough, or they may be dragged on mattresses or wrapped up in blankets and pulled along the floors.

(5) If any elevator, stairway, or exit is blocked, the fire marshal or some other responsible individual should direct the route of evacuation.

(6) Ambulatory patients should assemble in their wards and await orders to evacuate. Ward personnel should guide them if possible. It might be advisable to have them hold hands and move in single file so that they will not obstruct traffic in corridors or stairs.

(7) Litter patients are evacuated under the direction of ward personnel. If elevators cannot be used, alternate escape routes, previously selected, are used.

(8) Except in an extreme emergency, traction setups are modified from weighted to tied traction before a patient is moved. The emergency may be so great, however, that ropes and straps must be cut, and the patient evacuated immediately.

(9) Patients on Stryker, Foster, or Bradford frames are usually evacuated on the frames.

(10) If a maternity ward is involved, the newborn baby can be given to the mother and both moved together. If possible, a small oxygen tank should be used when incubator babies must be removed.

(11) Medical officers and nurses assigned to the various wards ordinarily accompany their patients to the site of the evacuation and remain there unless otherwise directed by competent authority. Only those enlisted and civilian ward personnel needed to assist in caring for the patients are normally retained; the rest are usually directed to report to the designated duty personnel assembly area. Local SOP's should designate the assembly points for evacuated personnel.

(12) After an entire ward has been evacuated, the wardmaster checks to see if any patients are missing. If any are, the fire marshal or other responsible individual is notified immediately.

8-62. Emergency Drills

Generally, emergency drills are conducted for duty personnel only and in a manner so that the patients are not aware that a drill is in process. Each facility conducts these drills as prescribed by its own regulation or SOP.

CHAPTER 9

ADMINISTRATION

Section I. ORGANIZATION OF THE AMEDD

9-1. Composition

The Army Medical Department consists of the following (AR 40-1):

a. The Surgeon General, a general officer of the Medical Corps, whose responsibilities are covered in AR 10-5.

b. The Deputy Surgeon General, a general officer of the Medical Corps, who assists The Surgeon General and acts for him in his absence.

c. The Assistant Surgeon General, a general officer of the Dental Corps, who assists The Surgeon General in matters pertaining to dental health service.

d. The Medical Corps, the Dental Corps, the Veterinary Corps, the Medical Service Corps, the Army Nurse Corps, and the Army Medical Specialist Corps.

e. Contract surgeons, professional consultants, warrant officers, enlisted personnel, and other personnel employed by the Army Medical Department.

f. The facilities, supplies, and equipment which are necessary to carry out its missions and functions.

9-2. Mission

The mission of the Army Medical Department is to maintain the health of the Army and to conserve its fighting strength. The department is responsible for *all* medical services provided within the Department of the Army.

9-3. Professional Qualifications

If the duties to which a member of the Army Medical Department is assigned involve professional work that is the same or is similar to that usually performed in civil life by a member of a learned profession, the Army member must possess equal or similar qualifications by education, training, or experience unless the exigencies of the situation prevent.

Section II. ORGANIZATION OF THE ARMY HOSPITAL

9-4. Organization

This section is a general resume only, as organization and terminology vary according to the class of hospital. AR 40-4 for class I hospitals and OTSG Regulation 10-2 for class II hospitals cover organization in greater depth. Figures 9-1 and 9-2 illustrate the organizational structure of class I and class II hospitals. The organization of a class I hospital, as described below, gives a general idea of the various services usually found in an Army hospital.

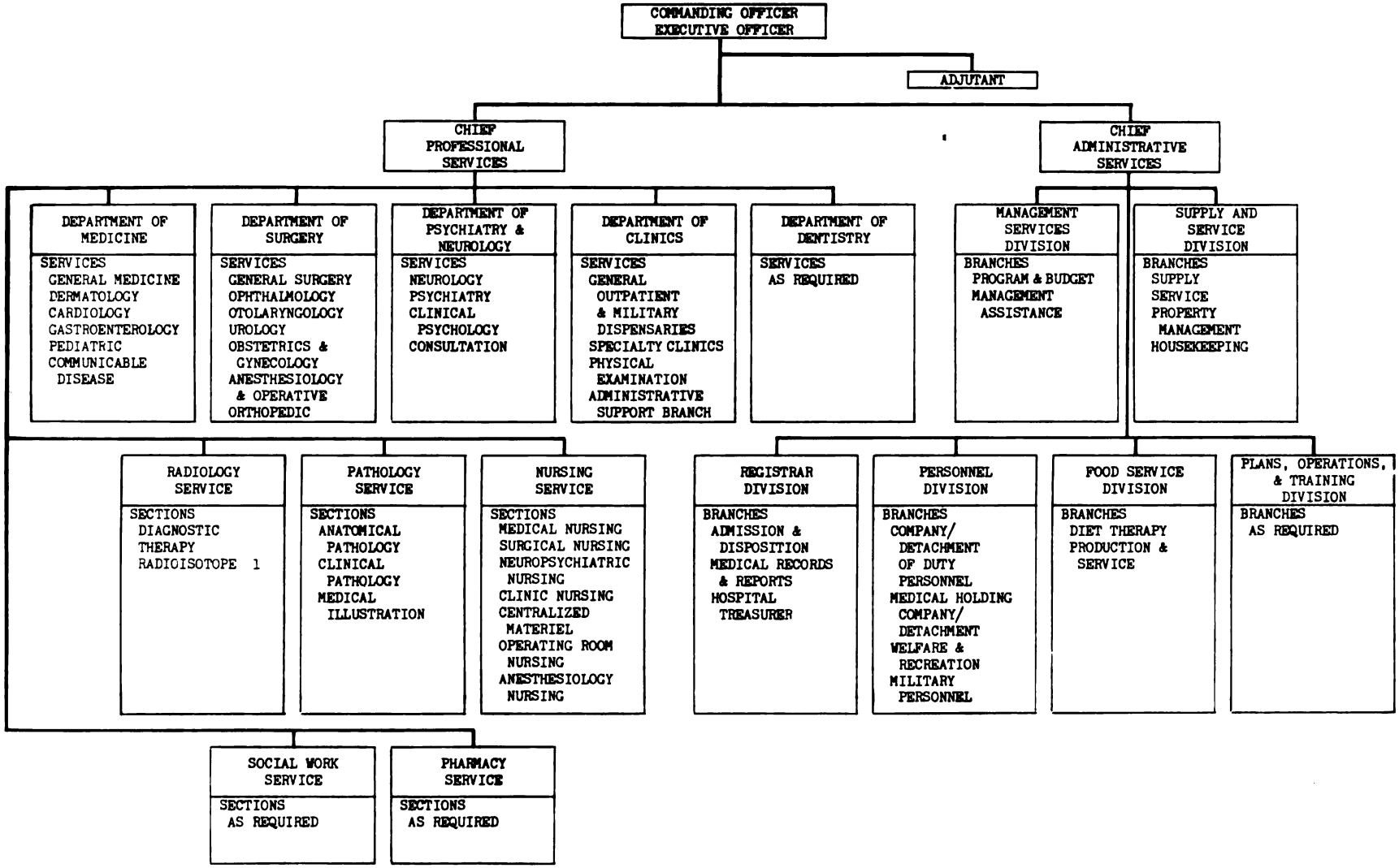
9-5. Office of the Installation Medical Department Activity Director/Hospital Commander

This office provides command policy direction and control over the Medical Department Activity (MEDDAC) program. (MEDDAC is an organizational entity established at an installation which has a U.S. Army hospital.)

a. Director/Commander. The senior Medical Corps officer assigned to the hospital. He is charged with direction of the MEDDAC program and the command, organization, and management of the hospital, as well as the other duties listed in AR 40-4.

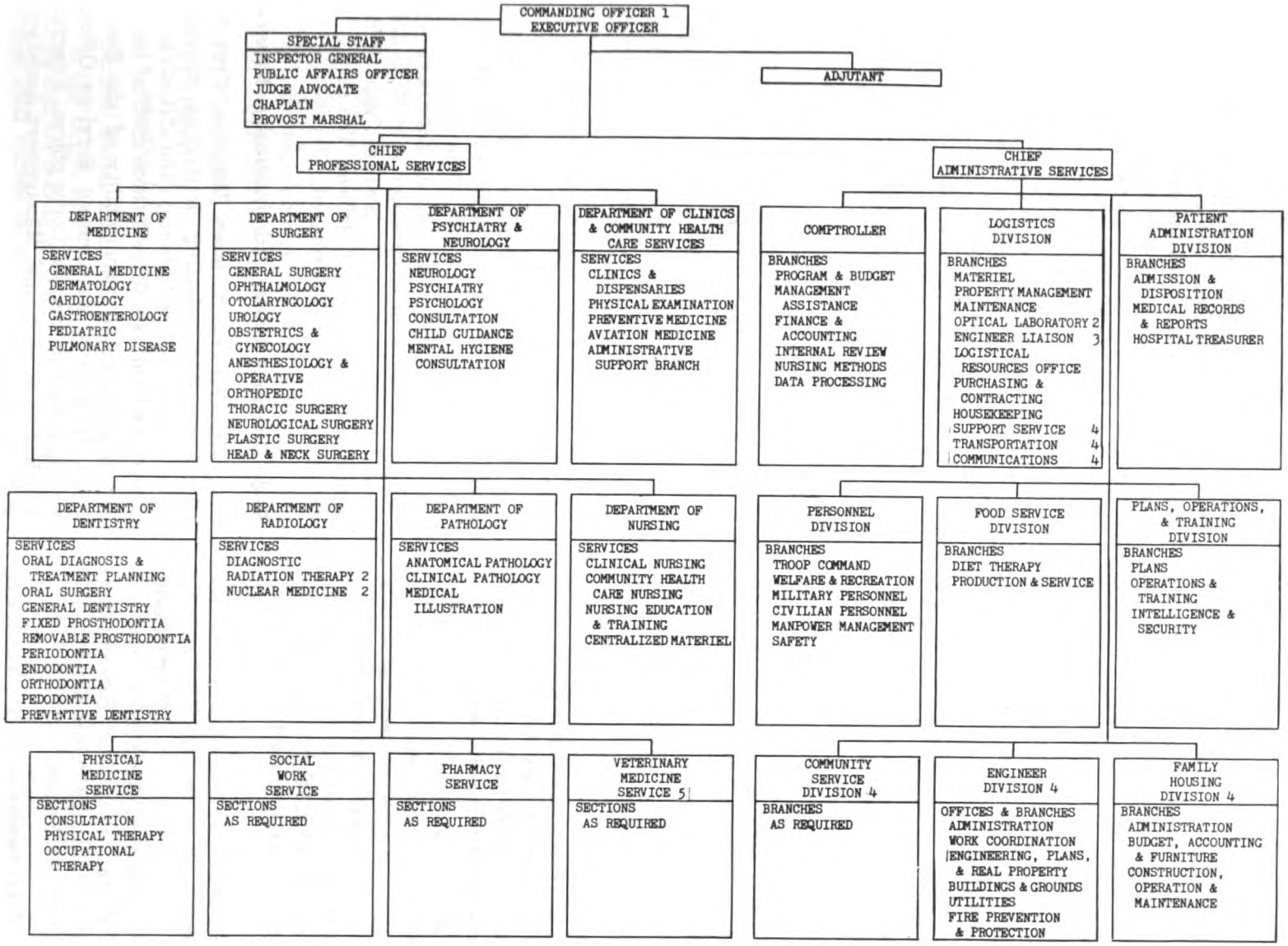
b. Executive Officer. A Medical Corps or a Medical Service Corps officer who advises and assists the Director/Hospital Commander on administrative matters. If an MSC officer, he may also serve as Chief, Administrative Service (*d* below).

c. Chief, Professional Services. A Medical Corps officer who functions as the principal advisor and assistant to the Director/Hospital Com-



NOTE 1 — Established only when authorized by The Surgeon General and will be operated under the provisions of AR 40-37.

Figure 9-1. Organization of a class I hospital.



NOTE 1 — When hospital provides medical support to a class I installation, the hospital commander will be the surgeon.
NOTE 2 — Established only when authorized by The Surgeon General.
NOTE 3 — Established only when hospital is an activity located on a class I installation which provides engineer support.
NOTE 4 — Elements included in the hospital organization when hospital functions as installation headquarters.
NOTE 5 — Established only when hospital has mission to provide veterinary service.

Figure 9–2. Organization of a class II hospital.

mander on professional matters and as coordinator of the professional elements of the MEDDAC. He directs and supervises the professional departments and separate professional services of the hospital.

d. Chief, Administrative Services. A Medical Service Corps officer who is responsible for supervising and coordinating administration reports of the MEDDAC. He also plans and coordinates the administrative elements of the hospital.

e. Adjutant. A Medical Service Corps officer responsible for accomplishing administrative duties assigned by the Executive Officer and providing office services and other related administrative support for the hospital.

9-6. Departments

a. Department of Medicine. Provides diagnostic service, care, and treatment to all patients assigned or referred to it. Includes the Chief, Department of Medicine, who is a Medical Corps officer; General Medicine Service; Dermatology Service; Cardiology Service; Gastroenterology Service; Pediatric Service; and Communicable Disease Service.

b. Department of Surgery. Provides diagnostic service, care, and treatment to all patients assigned or referred to it. Includes Chief, Department of Surgery, who is a Medical Corps officer; General Surgery Service; Ophthalmology Service; Otolaryngology Service; Urology Service; Obstetrics and Gynecology Service; Anesthesiology and Operative Service; and Orthopedic Service.

c. Department of Psychiatry and Neurology. Provides diagnostic service, consultation, care, and treatment for all patients assigned or referred to it. Includes Chief, Department of Psychiatry and Neurology, who is a Medical Corps officer; Neurology Service; Psychiatry Service; Clinical Psychology Service; and Consultation Service.

d. Department of Clinics. Provides or arranges for the examination and treatment of patients requiring clinic care. Includes Chief, Department of Clinics, who is a Medical Corps officer; General Outpatient and Military Dispensary Service; Specialty Clinics; Physical Examination Service; and Administrative Support Branch.

e. Department of Dentistry. Provides dental care and treatment for both inpatients and outpatients and for personnel assigned to the hospital. Also coordinates, as required, with installation Dental Activities in residency, intern, and other training missions. Directed by the Chief, Department of Dentistry, who is a Dental Corps officer.

9-7. Services

a. Radiology Service. Provides diagnostic and therapeutic radiological services as required in the examination, care, and treatment of patients. Includes Chief, Radiology Service, who is a Medical Corps officer; Diagnostic Section; Therapy Section; and Radioisotope Section.

b. Pathology Service. Provides complete laboratory service for the hospital. Includes Chief, Pathology Service, who is a Medical Corps officer; Anatomical Pathology Section; Clinical Pathology Section; and Medical Illustration Section.

c. Nursing Service. Provides safe nursing care in accordance with the policies and procedures prescribed by the hospital commander. Includes Chief, Nursing Service, who is an Army Nurse Corps officer; Medical Nursing Section; Surgical Nursing Section; Neuropsychiatric Nursing Section; Clinic Nursing Section; Centralized Materiel Section; Operating Room Nursing Section; and Anesthesiology Nursing Section.

d. Social Work Service. Provides professional social work services to patients and their families. Includes Chief, Social Work Service, who is a Medical Service Corps officer, and sections as required.

e. Pharmacy Service. Provides for accomplishments of those functions prescribed for pharmacies in AR 40-2 and AR 40-4. The Chief of the Pharmacy Service is a Medical Service Corps officer, MOS 3318, or if no officer with MOS 3318 is on duty at the hospital, a Medical Corps officer is designated at Pharmacy Officer. The service is divided into sections as required.

9-8. Divisions Under Administrative Services

a. Management Services Division. Provides such services as budgeting, accounting, management engineering, and progress and statistical reporting and analysis (except those medical statistics which are the responsibility of the Registrar). Includes a Management Services Officer, who is a Medical Service Corps officer; Program and Budget Branch; and Management Assistance Branch.

b. Supply and Service Division. Provides for computation of requiremens and the acquisition,

storage, and distribution of supplies and equipment to meet the needs of the hospital, as well as maintenance and repair of equipment and logistical services. Includes Chief, Supply and Service Division, who is a Medical Service Corps officer; Supply Branch; Service Branch; Property Management Branch; and Housekeeping Branch.

c. Registrar Division. Provides patient administration services for the hospital and acts as custodian of all medical and clinical records of inpatients and outpatients, to include administrative admitting and discharging of patients and medical data. Includes the Registrar, who is a Medical Service Corps officer; Admission and Disposition Branch; Medical Records and Report Branch; and Hospital Treasurer Branch.

d. Personnel Division. Provides for administration of military duty personnel matters and coordination of civilian personnel matters; staff supervision of enlisted duty and medical holding companies and detachments; and personnel management, administration, and record keeping. Includes Chief, Personnel Division, who is a Medical Service Corps officer; Companies/Detachments of Duty Personnel; Medical Holding Company/Detachment; Welfare and Recreation Branch; and Military Personnel Branch.

e. Food Service Division. Prepares and serves palatable and nutritionally adequate diets within established monetary limitations for patients and other authorized personnel. Includes Chief, Food Service Division, who is an Army Medical Specialist Corps officer (dietitian); Diet Therapy Branch; and Production and Service Branch.

f. Plans, Operations, and Training Division. Prepares peacetime, emergency, and mobilization plans; plans and coordinates assigned training programs; and assists other elements of the MEDDAC in developing and providing medical service support to installations. Directed by the Chief, Medical Plans, Operations, and Training Division, who is a Medical Service Corps officer.

Section III. ORGANIZATION OF NURSING IN ARMY HOSPITALS

9–9. Organization of Nursing in Class I Hospitals

The nursing service in class I hospitals (fig. 9–3) is organized as follows:

a. Office of the Chief Nurse, which includes the Chief, Nursing Service; Assistant Chiefs for Day, Evening, and Night; and the Educational Coordinator.

b. Clinical nursing sections, which may include—

(1) Medical Nursing Section.

(2) Surgical Nursing Section.

(3) Neuropsychiatric Nursing Section.

(4) Clinic Nursing Section.

(5) Centralized Material Nursing Section.

(6) Operating Room Nursing Section.

(7) Anesthesiology Nursing Section.

c. Clinical units, which are under the supervision of the chiefs of the several clinical nursing sections and are managed by a clinical head nurse. Clinical staff nurses on each of the clinical units are responsible to the clinical head nurse for performing duties as either a nursing team leader or a member of the nursing care team.

9–10. Organization of Nursing in Class II Hospitals

a. Nursing in class II hospitals (fig. 9–4) is organized as a Department of Nursing with a Nurse Administrator of the Army Nurse Corps as Chief, Department of Nursing. The Office of the Chief, Department of Nursing, also includes Assistant Chiefs, Department of Nursing, for Day, Evening, and Night.

b. There are four services within the Department of Nursing, as follows:

(1) Clinical Nursing Service, including—

(*a*) Medical Nursing Section.

(*b*) Surgical Nursing Section.

(*c*) Psychiatry and Neurology Nursing Section.

(*d*) Maternal and Child Health Nursing Section, to include obstetrical, pediatric, and nursery subsections.

(*e*) Operating Room Nursing Section.

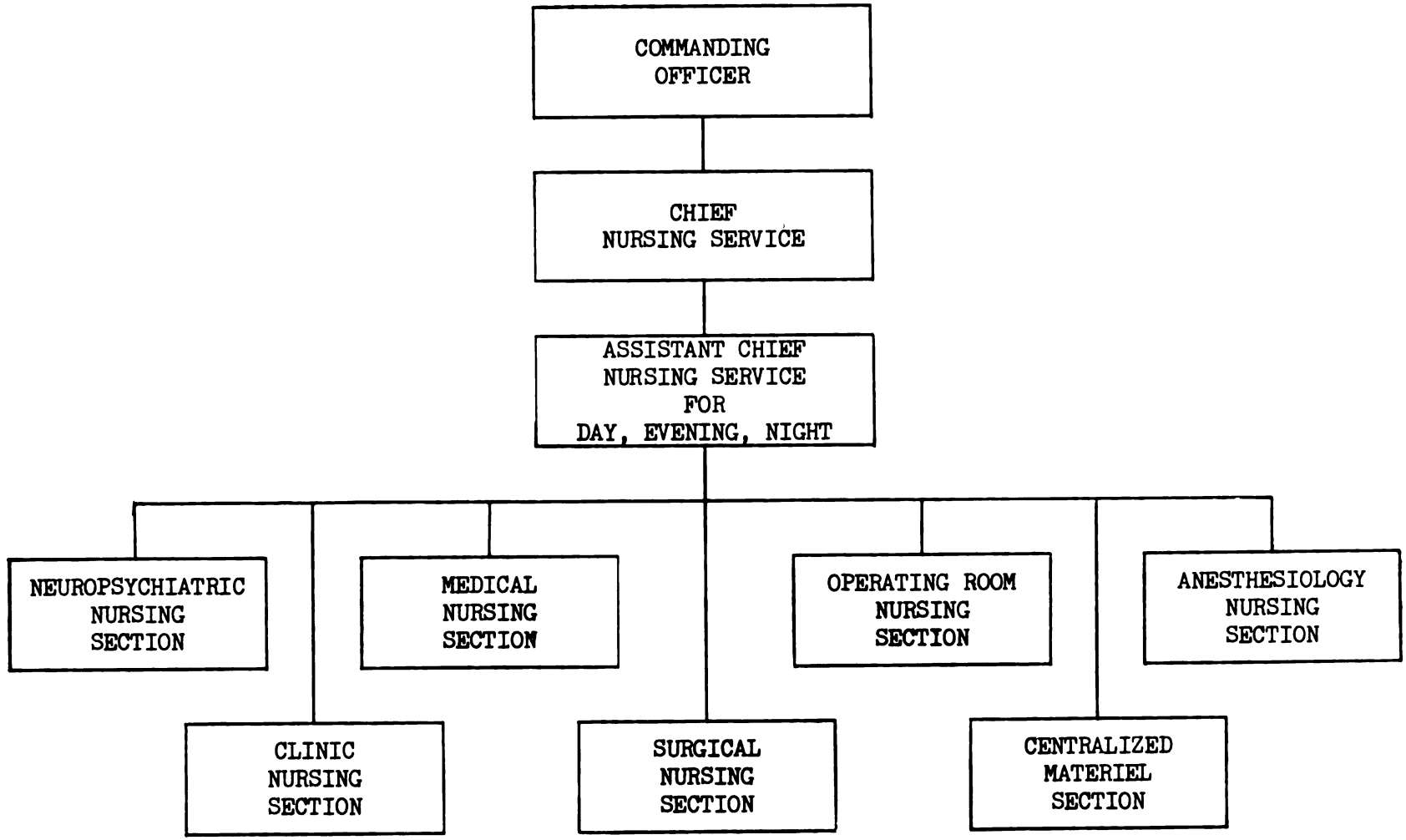
(*f*) Anesthesiology Nursing Section, to include inhalation therapy subsection.

(2) Community Health Care Nursing Service, including—

(*a*) Clinics Nursing Section.

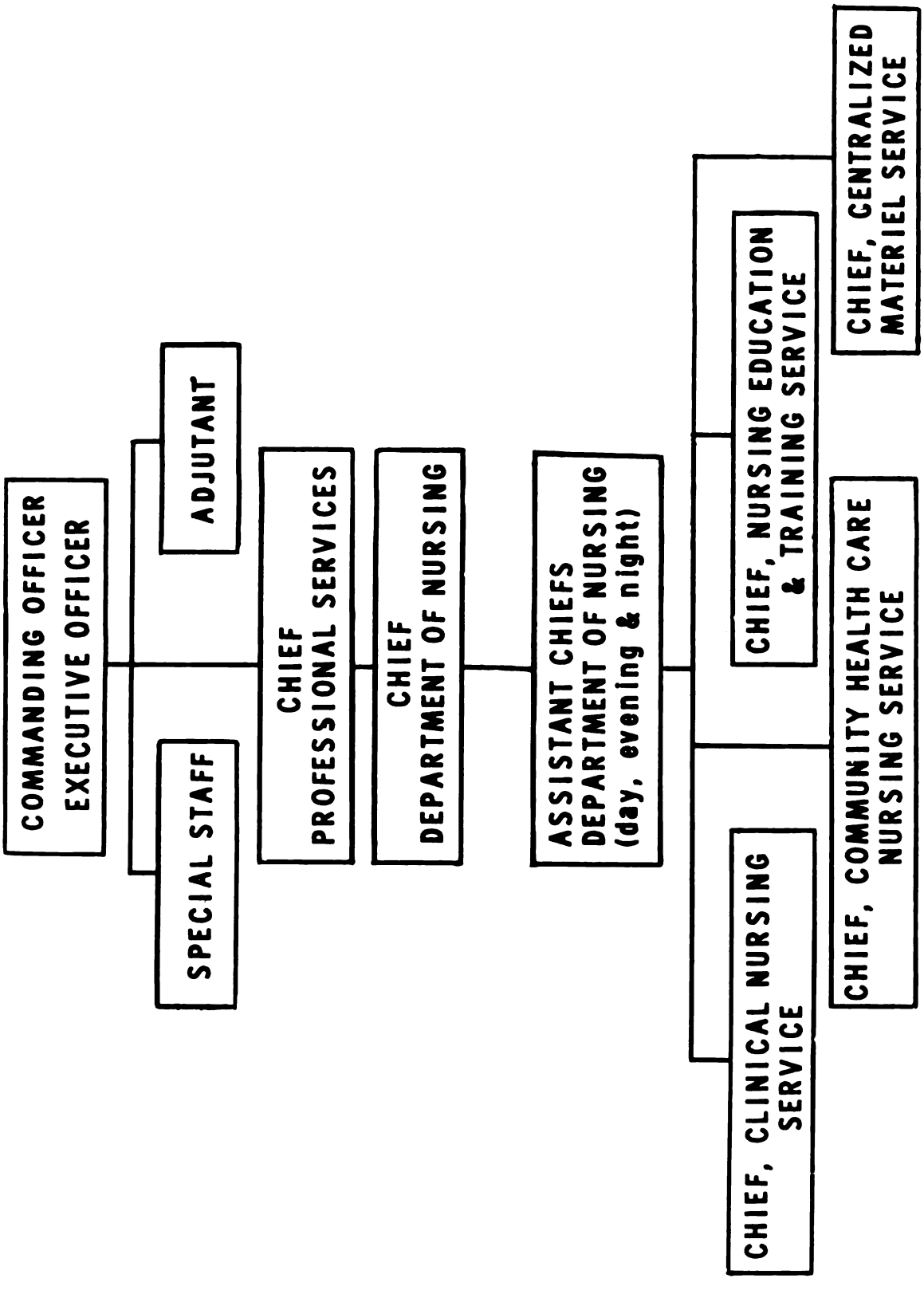
(*b*) Dispensaries Nursing Section.

(3) Nursing Education and Training Service, including—



Nursing Service
United States Army Hospitals
(Class I)

Figure 9-3 Organization of nursing, class I hospital.



Department of Nursing
U.S. Army General Hospitals
(Class II)

Figure 9–4. Organization of nursing, class II hospitals.

(*a*) Nursing Inservice Education and Training Section.

(*b*) Nursing Speciality Education and Training Section.

(4) Centralized Material Service.

c. Below the subsection level, nursing in the class II hospital is organized in the same fashion as in a class I hospital.

Section IV. ORIENTATION

9–11. General

a. Good orientation is good economy. The better the program, the faster the economy of time and effort expended to hasten productivity. Good orientation includes knowing the name of the newcomer (the rules of good etiquette and courtesy are as important in a patient care area as in any social situation). To be called correctly by one's own name is a part of the welcoming procedure and increases the worker's sense of belonging.

b. Appraisal of the orientation program should be carried out by all patient care personnel—those who orient and those who receive it. Both view the program and its outcome from different vantage points. Appraisal should include immediate and long-term results. Varied time intervals are essential for comprehensive and reliable data. Many things that seem unimportant in the initial orientation period grow in significance after a specialist has been on the job. Continuing appraisals and individual ratings give a system of checks and balances that enable the staff to support needed revisions intelligently.

9–12. Value of Orientation

Orientation ushers a new specialist into his work setting, instills a sense of security and belonging, results in better job performance, and increases job satisfaction.

9–13. Administrative Decisions About Orientation

a. The kind of orientation program needed by patient care personnel is determined by many elements in the situation, but it must be planned and not a hit-or-miss proposition. No two programs will be the same; however, there should be coordination between all segments of the patient care facility in orientation practices in order to avoid duplication.

b. Decisions on orientation cover a wide range of subjects, to include—

(1) *Time required.* No one can specify the exact length of time for orientation. People vary greatly in their ability to grasp new material, to understand or accept new roles, and to adjust to a new setting. Each specialist must be allowed to adjust at his own speed.

(2) *Responsibility for orientation.* This depends upon the situation. One individual should have the responsibility for the total program; however, different people may accomplish different parts. The Chief, Nursing Education and Training Service/Educational Coordinator, normally has the overall responsibility for the program. The chief of the nursing section where the specialist is to be assigned may orient him to the institution; on the other hand, the clinical head nurse or coordinator occupies the best position to initiate and continue orientation to the job.

(3) Timing of activities.

(4) Criteria for readiness for full duty.

(5) Followup procedures.

(6) Revision of orientation practices.

9–14. Basic Components of Orientation

The basic components of orientation include orientation of the—

- Individual to the institution.
- Administration to the new worker.
- Individual to other personnel.
- Individual to his unit and responsibilities of his job.

9–15. Approaches to Orientation Planning

Hospitals and other patient care facilities will have different approaches to orientation. Some will use the "buddy" system or rotating assignments; others will have an orientation unit or an initial assignment program. Still others will have a plan involving free observation and participation. The initial orientation program sets the stage for the association between the hospital and specialist and determines the relationship that will exist. *For example,* a rotating assignment is one way to familiarize a specialist to the whole nursing service, but it involves some disadvantages; rotating makes it hard for him to put down

TO BE ACCOMPLISHED BY OFFICE OF THE CHIEF NURSE	TO BE ACCOMPLISHED BY UNIT	
I. Organization a. Mission of organization b. Role of employee's position in accomplishing mission c. Chain of command II. Employee's Position a. Duties and responsibilities b. Standard of performance expected c. Intro. to supervisory staff d. Alert assignment III. Working Conditions a. Area of work b. Hours of work c. Rest period -- restrooms d. First aid facilities IV. Specific Rules of Hospital a. How to request leave b. How to report injuries and accidents c. Hospital regulations 1. Safety 2. Fire 3. Security V. Security Regulations a. Other rules b. How to report injuries and accidents VI. Location of a. Eating facilities b. Bulletin board c. Medical facilities d. Banking facilities e. PX and commissary f. NCO and EM club g. Billeting office	I. Physical Layout a. Purpose of each area b. Responsibility for maintenance II. Personnel a. Introduction to all personnel on unit b. Duties of each category of worker 1. Registered nurse 2. Clinical specialist 3. Wardmaster 4. Medical specialist 5. Medical corpsman 6. Civilian worker III. Patient Administration a. Ward procedure manual b. Clinical record 1. Composition; responsibilities 2. Nursing book unit 3. Nursing notes, doctor's orders, nursing care plans 4. Admission, transfer, and discharge procedures 5. Disposition c. Request slips, lab, X-rays, consultations 1. How initiated; use of name plate 2. Forwarding 3. Recording 4. Filing d. Clinic appointments e. Food service 1. Ward service and nourishments 2. Mess hall f. Procedure for placing on and removing from seriously ill and very seriously ill list	IV. Ward Administration a. Requisitioning procedures 1. CMS 2. Pharmacy 3. Laundry 4. Work and repair orders b. Assignment of personnel 1. Ward duties 2. Nursing care assignment 3. Time schedule V. Medications a. Narcotics 1. Narcotic registry 2. Ordering and safeguarding of narcotics 3. Narcotic count 4. Recording b. Pharmacy 1. Metric system 2. Familiarization with formulary VI. Miscellaneous a. Red Cross 1. Social service 2. Ward supplies 3. Ward recreation b. Status of patients 1. Rules of conduct 2. Leaves and passes c. Ward library d. Emergency plans 1. Fire 2. Disaster

Figure 9–5. Sample orientation, nursing service.

roots and may cause a feeling of insecurity. A more profitable approach might be to leave him in his initial assignment until he begins to feel at home before starting to rotate his assignments.

9–16. Orientation of the Specialist to His Work Environment

a. This is the level at which a well-planned and well-conducted program on other levels can be wrecked or strengthened. The thoroughness and effectiveness of this aspect of orientation will be felt throughout the period of assignment. The specialist's supervisor will also profit in time saved in supervision, correction of errors, and counseling relative to work relationships if this phase is adequate.

b. Knowledge of the physical environment is essential to the job because within this setting the specialist finds the tools and resources to accomplish his job. The nurse in charge will ordinarily introduce the new specialist to the patients and personnel in his unit. The specialist's immediate supervisor should orient the new specialist to his work role—his place in the formal organization (fig. 9–5). This should be defined in terms of standards (expectations) of the job, accountability for what and to whom, supervision on the job, opportunity for advancement, educational functions, and the specialist's scope of responsibilities.

NOTE

The responsibility for this phase of the orientation program may be assigned to the wardmaster.

A new specialist has the right to expect to have time to adjust to new work situations, assistance in finding out where he is and what he is to do, and then assistance in meeting the standards of performance required.

c. Becoming acquainted with the informal organization of the work setting requires a great deal more time than the formal. The new specialist is aware that he must find his place. Unless he becomes a part of the informal organization, he will not function to his maximum effectiveness.

d. Interpretation of policies, regulations, and procedures is also a long-term process, even though some brief familiarization should be included in the initial orientation. High priority in these matters should be given to those that insure the patient's safety and welfare. *For example*, newcomers should know the fire regulations, procedure for evacuation of patients, and location of emergency setups such as oxygen and drugs.

9–17. Evaluation of Orientation

This should be an integral part of the program. The persons who have the most responsibility for planning and conducting the orientation should also plan for a continuous feedback during the early weeks in order to appraise the program in terms of fulfilling the goals that were set. Effectiveness can be measured later by whether it met the immediate concerns of the new specialist and whether it prevented fear and insecurity. It can also be rated by his readiness in assuming his duties and in meeting the standards of his job. The following are some indications of a need for revision or expansion of orientation practices:

- Failure of specialist to function well and to adjust to the new environment with ease.
- Failure of patients to accept new specialist.
- Insecurity shown by specialist (e.g., failure to seek guidance).

Section V. TRAINING

9–18. General

a. MOS 91A, Medical Corpsman. After graduation from the U.S. Army Medical Training Center with a 91A MOS, the corpsman should have a planned, supervised clinical experience in order to be able to gain skill in applying the procedures taught in the classroom to the actual care of the patient. As the individual with MOS 91A gains skills in his level of work through further clinical experience in advanced procedures and patient care, he may attain an MOS 91B.

b. MOS 91B, Medical Specialist. This specialist's training must be at an advanced level which is gained through on-the-job training.

c. MOS 91C, Clinical Specialist. MOS 91C training is conducted in schools specifically for that purpose. The instructors in the Clinical Specialist Course teach in the didactic area and supervise the students in the clinical area.

d. Details. AR 611–20 gives details of duties and responsibility for MOS 91A, 91B, and 91C.

TRAINING SCHEDULE
BOOKER GENERAL HOSPITAL
Fort General, Texas 78123

WARD TRAINING Subject	Day and Date	(DIDACTIC TRAINING-10C CLASSROOM) Time	Subject	References
1st Week	Monday, 7 Jan Tuesday, 8 Jan Wednesday, 9 Jan Thursday, 10 Jan		Report in, Records Orientation, TI&E Review of 91A Procedures	
2d Week Assisting with Sterile Procedure	Thursday, 17 Jan	1300-1445 1500-1600	Introduction to Anatomy Anatomy of Musculo-Skeletal system Intake & Output Records	TM 8-230, or any anatomy and phys. text
3d Week Isolation Technique	Thursday, 24 Jan	1300-1445 1500-1600	Conditions of the Musculo-Skeletal system. Casts and Traction	TM 8-230, or surgical or orthopedic nursing textbook
4th Week Injection Technique	Thursday, 31 Jan	1300-1350 1400-1450 1500-1600	Anatomy of Circulatory Sys. Conditions of Circulatory Sys. Oxygen Therapy	TM 8-230, or any anatomy and phys. text, and medical nursing text
5th Week IV Therapy	Thursday, 7 Feb	1300-1350 1400-1450 1500-1600	The Blood and the Lymph Conditions of Circ. Sys.,Shock Sterile Dressings	TM 8-230, or any anatomy and phy. text and any medical text
6th Week Prep for Diagnostic Procedures Chest Drainage	Thursday, 14 Feb	1300-1350 1400-1450 1500-1600	Anatomy of Respiratory Sys. Condition of Respiratory Sys. Respiratory Procedures	TM 8-230, or any anatomy and phys. text or any medical text
7th Week Immunizations	Thursday, 21 Feb	1300-1350 1400-1450 1500-1600	Anatomy of Digestive Sys. Condit. of Digestive Sys. Suction Siphonage	TM 8-230, or any anatomy and phys. text; surgical nurse text

Figure 9–6. Sample formal training schedule.

NURSING SERVICE
BOOKER GENERAL HOSPITAL
Fort General, Texas 78123

SUBJECT: Class schedule for first week for OJT training

FIRST DAY

1. Sign in detachment
2. Report to Ward 10-G
3. Order name tags
4. Draw bedding, whites; turn in weapons
5. Put field gear away; set up housekeeping in quarters

SECOND DAY

1. Orientation to the hospital (other than Wd personnel taken to duty station)
2. Proficiency training orientation
   a. First SGT
   b. Field First SGT
   c. Chief Wardmaster, Nursing Service
3. Review of hospital routine, duties, 3 duty shifts

PM SECOND DAY

4. Bed making
5. Bed bath
6. Oral care — WARD 2-A DEMONSTRATION
7. Back care

THIRD DAY

1. T.P.R. and B/P (Demonstration and return)
2. Admission of patients to the ward

PM THIRD DAY

3. Cleansing enema
4. Collection of specimens
5. Diagnostic test, examinations, collections of specimens

FOURTH DAY

1. Role of the Medical Specialist
2. Intake and output
3. IM injections (Demonstration and return)

PM FOURTH DAY

4. Review OJT folders
5. Introduction of the Wardmasters
6. Tour of assigned Sections

FIFTH Day -- Start work in Duty Sections (make up classes as needed)

Figure 9-7. Sample OJT training schedule.

9–19. Responsibility for Training

a. The overall training program for hospital personnel is the responsibility of the Chief, Plans, Operations, and Training Division. The training program, as it pertains to the nursing portion of the primary patient care of MOS's 91A and 91B, is delegated to the Chief, Department of Nursing/Service. This responsibility is further delegated to the Chief, Nursing Education and Training Service/Educational Coordinator, in the case of an operating medical treatment facility, or to the training nurse for a nonoperating facility in a training status. Figures 9–6 and 9–7 illustrate the type of training that may occur.

b. The hospital in a training status, whether Stateside or overseas, will have a requirement for training in MOS 91A and B. As these hospitals do not have any patients, the training nurse of the hospital must seek patient care experience in operating hospitals for these personnel. The supervision of the students will be accomplished either by the staff of the Chief, Nursing Education and Training Service/Educational Coordinator, or by the training nurse.

c. In addition to the trainee in *b* above, the Chief, Nursing Education and Training Service/Educational Coordinator, has a training program for his own assigned 91A and 91B personnel.

d. In combat areas, training programs may be developed for assigned personnel, personnel assigned to nonmedical units, or enlisted personnel of allied forces.

e. In oversea areas other than combat, training programs may be provided for foreign national ancillary personnel such as foreign-hire nurse's aides.

Section VI. ADMINISTRATIVE PROCEDURES FOR NURSING PERSONNEL

9–20. Utilization of Personnel on the Ward

Good ward administration includes proper utilization of duty personnel assigned to the ward. It insures a systematic distribution of personnel so that the ward unit has a 24-hour coverage, and it distributes the workload fairly according to the various levels of skills and knowledge of the members of the patient care team.

9–21. The End-of-Shift or Exchange Report

a. A report is made by personnel (usually the nurse in charge) going off duty to those coming on duty. The report is an oral one and is made to all personnel coming on duty. It covers operation of the ward and condition of the patients, to include any observations or problems. Following this report, assignments are given to incoming personnel.

b. Three forms are used for assignments: DA Forms 8–246, 8–250, and 8–256. Use of these forms are encouraged since they assist in providing good nursing service administration. Penciled entries may be used on all three.

9–22. Nursing Service—Assignment Roster

DA Form 8–246 (Nursing Service—Assignment Roster) is used to make consolidated assignments on housekeeping and patient care. It also includes meal hours, classes, military duties, and ward management tasks. The form (fig. 9–8) is made out in pencil or covered with acetate or some other see-through material in order to facilitate changes which might be made during the week. Routine ward duties and administrative tasks are grouped so that each person on a tour of duty knows the recurring activities for which he is responsible. Duties are assigned by duty numbers such as duty 1 or duty 2. A master list of these ward duties should be posted on the ward bulletin board (fig. 9–9 shows a sample of one type of master list). These duties may also be posted on 5 x 8-inch cards in the Nursing Book Unit.

9–23. Nursing Care Assignment

DA Form 8–256 (Nursing Care Assignment) is prepared daily by the head nurse or charge nurse and is distributed at the time of the Exchange Report. It is used to give a daily written assignment of the nursing care for which each nursing member is responsible (fig. 9–10). It provides a method of assigning patients to the various levels of nursing personnel according to the proficiency of the personnel in caring for the nursing needs of the individual patient. If a Nursing Care Plan has been developed, the assignment may say "See Nursing Care Plan" or "See Care Plan Card." The specialist will carry out the assignment as listed. Nursing Service personnel can note observations or treatment of a patient's condition, his

WARD NUMBER: 2A

NURSING SERVICE - ASSIGNMENT ROSTER
(AR 40-408)

NAME	SUNDAY	MONDAY	TUESDAY	WEDNESDAY
	* / ** L-1	/ L-1	/ L-1	DUTIES, RELIEF AN
Major Jones HN	Duty 1	Duty 1 and 2	Duty 1	Duty
	/ L-2	DO	/ L-2	
Major Hand Staff Nurse	Duty 2 205 (1+2		Duty 2	
	/ L-3	/ L-2	/ L-3	
Mrs. Roan GS-6	206 (all patients) 209-8	206 (all patients) 209-8	206 (all patients) 209-8	
	/ L-1	/ L-2		
Pfc Runner 917	215 (1-4) assist mrs. Roan with 209-8	210 (1-8) 215 (1-4)	215 (1- assist mrs- with	
	DO	/ L-1	/	
Pvt Slowl Wd. Clerk		Duty 11	Dut	

*Duty hours. **Meals - Indicate lunch with L^1 or L^2 and Supper with S^1 or S^2

DA FORM 1 SEP 54 8-246

Figure 9-8. Sample completed Nursing Service—Assignment Roster (DA Form 8-246).

Duties of Wardmaster, 91C40 -- 0700-1500 Duty No. 7

1. Patient care as assigned.
2. Supervision and teaching of enlisted personnel.
3. Responsible for ward housekeeping.
4. Responsible for supply levels -- quartermaster item and medical items -- linen.
5. Coordinate all EM activities and company duties with head nurse.
6. Check emergency tray daily.
7. Attend wardmaster meeting weekly.

Duties of Clinical Specialist, 91C20 -- 0700-1500 Duty No. 8

1. Patient care as assigned.
2. Assist with medications and treatments.
3. Check isolation equipment (setup and supplies) daily.

Duties of Medical Specialist, 91B20 -- 0700-1500 Duty No. 9

1. Patient care as assigned.
2. Serve diet trays, feed patients.
3. Check and resupply treatment and emergency equipment room at end of shift.
4. TPR and blood pressure 1200.
5. Pass nourishments.

Duties of Medical Corpsman, 91A10 -- 0700-1500 Duty No. 10

1. Patient care as assigned.
2. Pass out linen Mon - Wed - Fri.
3. Assist wardmaster in daily linen requisition.
4. Empty waste basket 1000 and 1500.
5. Escort service.
6. Fresh water to all patients 1000 and 1500.

Figure 9-9. Sample page from master list of ward duties.

NURSING CARE ASSIGNMENT (AR 40-408) — HEAD NURSE: Major Jones

ASSIGNMENTS FOR (Nurse, Technician, Civilian attendant): Pfc Runner

WARD: 2A — DATE: 13 Jan 69

R/B	NAME OF PATIENT	BATH	TREATMENT AND CARE
215-1	Mrs Lyons	bed	A.M. Care & oral hygiene. Save all emesis.
-2	Mrs White	help	A.M. Care & oral hygiene. Check urine before lunch.
-3	Mrs. Adams	bed	A.M. Care & oral hygiene. Keep L. leg elevated.
-4	Mrs. Gino	self	Fully ambulatory. Check BP qh.
209-8	Mrs. Daye	bed	See Nursing Care Plan.

SIGNATURE

DA FORM 1 JUL 57 8-256 — U S GOVERNMENT PRINTING OFFICE 1957 O—431882

Figure 9–10. Sample completed Nursing Care Assignment (DA Form 8–256).

reaction to medication, and special points on the back of the form.

CAUTION

These notations do not eliminate the responsibility of the individual to report immediately any condition or reactions that require emergency care.

This form is signed and turned in to the head nurse. The notations can then be transcribed to the Nursing Notes if desirable. Afterward the form is destroyed. This form is used in conjunction with DA Form 8–250 (Nursing Care Plan).

9–24. Nursing Care Plan

DA Form 8–250 (Nursing Care Plan) is developed by the head nurse or nurse in charge. It indicates how to give nursing care to each individual patient to achieve the best results, to include specific nursing services the patient should receive (fig. 9–11). Additions and changes are made as needed.

NOTE

Figure 9–11 illustrates the plan for Inez Daye who has bed number 209–8. Figure 9–8 shows that PFC Runner assists with this patient, and figure 9–10 follows through by including Mrs. Daye in PFC Runner's assignment. (These forms are simplified, and figure 9–8 does not show the entire week.)

LAST NAME – FIRST NAME – MIDDLE INITIAL	REGISTER NUMBER	WARD NUMBER	BED NUMBER
Daye Inez	78920	2A	209-8
DIAGNOSIS: CVA		RELIGION: Prot	

NURSING CARE REQUIREMENT				TYPE OF (Check applicable boxes)					
CATEGORY (Check one)				PATIENT			BATH		
1	2	3	4	BED	WHEEL CHAIR	BATH ROOM PRIVILEGES	TO BE GIVEN	NEEDS ASSISTANCE	SELF CARE
X				*			*		

SPECIAL MEASURES TO BE TAKEN RELATING TO THE PATIENT'S PHYSICAL CONDITION, PSYCHOLOGICAL AND SPIRITUAL WELL BEING IN ADDITION TO TREATMENT, MEDICATION AND DIET. (Verified by signature of head nurse)(Continue on reverse side)

12 Jan 69, Observe closely for level of consciousness.
Keep extremities in proper alinement.
Note any response to stimulation, movement of extremities, pupillary changes, temperature, and moisture of skin.
Keep airway clear.
Oral hygiene q. 2h.
Keep side rails in place.
Observe catheter drainage system q. 2h.
Bathe entire body with superfatted soap at least daily and when skin is soiled.
Special skin care q. 4h.
Lanolin to hands, elbows, feet, heel, knees. Massage bony prominences.
Turn from side to back q. 2h. Alternate sides.

DA FORM 1 JAN 55 8-250 NURSING CARE PLAN (AR 40-408)

(FRONT)

Figure 9–11. Sample completed Nursing Care Plan (DA Form 8–250).

SPECIAL MEASURES (Continued)

13 Jan 69. Reassure patient.
Explain procedures to patient. Explain why side rails are in place.
Be patient and helpful when she tries to talk. Try to guess or anticipate her desires to relieve her frustration of inability to communicate clearly.
Secure assistance as necessary to carry out care.
Encourage her to increase fluid intake.

14 Jan 69. Encourage other patients to talk to her.
Feed slowly. Check temperature of food.
Brush teeth 3X a day and give complete mouth care.
Apply ointment to lips.
Physical therapy at bedside.

(BACK)

* U.S. GOVERNMENT PRINTING OFFICE : 1967 O—247-089

Figure 9–11.—Continued.

CHAPTER 10

PEDIATRIC NURSING

Section I. INTRODUCTION

10-1. Definition

a. Pediatrics is that branch of medicine that deals with (1) the diseases of children and their treatment and (2) the child's development and care.

b. Pediatric nursing is considered a specialty area within the field of nursing. The information that is offered will assist the specialist in his care of the pediatric patient; however, he should never proceed in his care of the patient unless directed by the nurse in charge. Irreparable damage can be done by the well-meaning, but poorly informed specialist. Although care of the newborn is usually considered a part of obstetrical nursing, certain aspects of newborn care are presented here in order to maintain continuity.

10-2. Physical Differences Between Infants, Children, and Adults

The child is *not* a "little adult." As table 10-1 shows, there are real physiological differences between children and adults.

Table 10-1. Physical Differences Between Infant, Child, and Adult

	Infant	Child	Adult
Susceptibility to disease	Inherits immunity to some diseases for around 6 months from his mother.	Highly susceptible to respiratory infections. Many minor illnesses of short duration and many contagious diseases. Gradually builds up immunity.	Has developed certain resistance to some infections.
Nutritional needs	Frequent feedings needed	Greater because he is growing and developing.	Less.
Cardiovascular system	Blood loss is more drastic, Differs from adult in blood pressure (higher), blood volume (lower), and cardiac output. Vital signs are unstable.	Heart develops in size less rapidly than body. Its work is increased. Easily damaged by toxins and bacteria and must be protected against strain during convalescence. The blood pressure may fall.	Tolerates a greater blood loss than infant or child.
Central nervous system	Not fully mature. Some reflexes are absent. Temperature fluctuates.	Same as infant. Hand-eye coordination are not complete.	Mature reflexes present in normal person. Stable temperature regulator.
Gastrointestinal system	May swallow air. Thin muscles of abdomen predispose to gastric distention. Vomiting may be dangerous.	Vomiting may be dangerous	Mature system in normal person. Vomiting not usually dangerous if conscious.
Pulmonary system	Often has irregular respiration, chest wall is thin, and pressure or restraint may deter breathing. Artificial respiration is given differently (ch. 8). See statements about child which also apply to infant.	Intercostal muscles that help breathing are not fully developed. Lumen of trachea is smaller and easily occluded by secretions. Large catheters can irritate trachea and cause laryngospasm or cardiac arrest in the young child.	Mature system in normal person.
Urinary system	Not fully developed. Dehydration and overhydration may occur rapidly. Difficult to excrete toxic substances.	Same as in infant	Mature system in normal person.

10-3. Effect of Illness on Child's Personality and Behavior

a. The developing personality can be affected by illness; for example, "being different" because of illness can definitely change a child's personality. Just being physically separated from his family can cause anxiety. This anxiety can often be helped by letting the child play out his problems. Nursing personnel can also help by understanding the child's feelings. Just when he needs his parents most, he is separated from them and surrounded by strangers in a strange environment where he has to eat different foods.

b. A child patient needs much closer observation than an adult patient. Medical specialists must learn to recognize the types of behavior that indicate specific conditions or problem areas. This recognition includes fear and withdrawal. The specialist must also realize that the quiet good child may be suffering the greatest trauma. Among the causes of behavioral problems are—

(1) The child's response to hospitalization as a threatening situation.

(2) Child's fear that his parents have abandoned him.

(3) The belief that hospitalization is a punishment for previous "bad" behavior. (The child may have been threatened with shots or told that he will become sick if he does so and so.)

(4) Negative attitude of parents, which can affect child. Thus, you can expect tantrums, refusal to eat or cooperate, attempts to "run away," or attacks on other children. You can also expect different reactions on different days. A child may suddenly refuse to eat a favorite food or accept one that he previously rejected. He may also suddenly refuse to accept help from a favorite specialist.

c. The proper psychological approach is necessary to prevent as much trauma to the child as possible and to accomplish nursing objectives. Use as little force as possible and then only that which is absolutely necessary. The following approaches are some that might be helpful in dealing with children:

- Never lie to a child.
- Remember that a child's attention span is short, especially in the very young.
- Keep explanations brief and positive. Don't allow him to be in a position where he can say no.
- Never use treatment, injections, etc., a threat.
- Do not tell a child of forthcoming treatment other medical needs until immediately be they are performed, as the child will prob become anxious—but *do* inform him.
- Tell the child that the treatment, medici etc., are given to make him well. Offer s explanation even if a child is crying.
- Do not talk down to a child, but be sure understands you. Use the terms his family for going to the toilet, for bottles, etc. Also his nickname, as he may not recognize Christian name.
- Reward him for acceptable behavior with approval.
- Attempt to keep him busy and distracted f unpleasant situations. Try new approaches.
- Make games of procedures if possible (stars for drinking a certain amount of fl "hero" badges for bravery, saving medi cups to show his mother).
- Consider each child as an individual with r of dignity and modesty, and respect t rights.

d. If misbehavior occurs despite everything can do, his misbehavior must be dealt with certain rules can be used for guidance—

Rule 1. Keep discipline firm, just, and consis

Rule 2. Deal with misbehavior as it happen you ignore the breaking of rules, you we discipline and confuse the child. Howeve nothing when extremely angry.

Rule 3. Explain the reason for rules. It will the child (after 2½ years) to understand he is not just being pushed around—that rule has a reason behind it

CAUTION

Be sure you do have a good reason.

Rule 4. Keep your voice calm. It does no go scream at a sick child (his illness is pro affecting his behavior) or to talk in a loud to a child who does not understand you.

Rule 5. Avoid bribes; they let a child remai mature and be paid for it.

Rule 6. Whenever possible, give the child a r for changing undesirable behavior to goo havior.

Rule 7. Make suggestions positive rather negative. "Put your toys in this box," r than "Don't throw toys all over the floor."

Rule 8. Do not ridicule a child.

	Elimination	Bathing and dressing
ıntal foods. Hold the ıis head, neck, and ı is open; otherwise, ıs mouth and choke ough so he doesn't ; that the fast flow ent intervals, as a ıeding. Keep atmos- year, the child will ; only one food at a ıely.	No control over body function. The first stool, *meconium*, is dark green, thick, and sticky and is passed at any time up to 24 hours after birth. A breast-fed baby has bright yellow and soft stools, with 3 to 6 BM per day. A bottle-fed baby's stools are yellow to brown, firmer, and usually fewer in number—1 to 4 a day. In both cases, the BM's gradually decrease to 1 or 2 a day.	Must be bathed daily (including shampoo) and kept dry and comfortable. In bathing, give special attention to areas of skin that contact each other such as in the neck, behind the ears, in the axillae, and in the groin. Dry well. Powder is not used in hospital. Bathe him lying down. By 6 months, he enjoys splashing in the tub. Use loose-fitting clothes of simple design.
ıke solid foods. May le may also change ıt to feed himself ıeal a day. May also erving. Although he ecial person to feed	At 30 months, bowel training is usually completed. He can even get to the bathroom fairly well but may have trouble undressing. Usually wants privacy but may ask for help when he is through. May have 2 BMs a day or may skip a day or two and still be normal. Not yet in control completely of his bladder. Wants to be changed if he is barely damp. May wet the bed.	At 30 months, he likes his bath but may have some ritual about the soap, plug, or faucet. May want to wash himself, but he doesn't do a good job. However, he is more interested in playing. Can take off his clothes but has trouble putting them back on. May fight against being dressed or be particular about his clothes.
better appetite than ıds, may or may not ay dawdle or want l may have definite ıoesn't have a good ıeals. May leave his at all. The 5-year- ıt he eats may vary himself. May have ısually try different eating. At 5½ to 6 ired.	The 3-year-old has little difficulty with BM's and can usually take care of himself fairly well. Also has fewer accidents and less bed wetting. Usually sleeps through the night. The 4-year-old is able to manage with little or no help from adults. Very much interested in the bathroom proclivities of others. The 5-year-old usually does not need help but may need reminding when he is playing.	The 3-year-old usually does a fair job of washing himself, but he still likes to play in tub and may not want to get out. Does not usually have any ritual. Can put on most clothing and unbutton a garment (unless the buttons are at the back). The 5-year-old usually does a relative good job on bathing. If reminded, he can wash his hands and face before eating. Although he can usually dress himself, he still cannot button back buttons or tie his shoes. Someone must choose and put out his clothes. He may not always *want* to dress himself even when he can.

METHOD OF DEALING WITH MISBEHAVIOR

- Give a child a substitute outlet for anger such as having him pound pegs.
- Isolate the child if possible; it will give him time to calm down and think about his unacceptable behavior and your response to it. Children normally want approval of their actions and will modify them if they feel that these actions are not accomplishing the desired result. This isolation period should be brief and the child should be allowed to resume his normal activities with the other children as soon as he is reasonable.
- Deprive the child of an activity or a toy—but *not* of a highly prized toy such as a stuffed animal that he always sleeps with.

10–4. Effect of a Child's Illness on Parents

When you treat a child, you must also consider the feelings of the parents. If they are worried and tense, the child will soon sense it.

Parents may be disturbed because of—

- Guilt feelings.
- Fear of
  - ------the unknown.
  - ------improper care for the child.
- Fear that
  - ------the child will suffer.
  - ------others in the family may contract the disease.
  - ------the child may transfer his love to the people who now care for him.

These worries can make parents illogical, unreasoning, and demanding. Although this puts an extra load on the pediatric specialist, he must understand people and their problems and be sympathetic with them.

10–5. Growth and Development

a. Stages of growth and development are not marked with sharp lines. Mental development, for example, begins long before it is discernible, but the degree of its progress is influenced by the child's environment and his social development. No child will fit within any absolute pattern, but certain norms an be established. The child will change and develop continuously but the growth can be uneven, with wide fluctuations within the normal. *For example,* most children will crawl before they walk, but they will not all crawl at exactly the same age.

b. Pediatric nursing personnel are in contact with a child for only a short time and then only when he is ill. He may not respond as he might if he were well. However, a knowledge of normal behavioral patterns for his age (table 10–2) will assist in understanding the child. Remember, though, that the child can fluctuate widely from this norm and still be perfectly normal.

(table 10–2)

(Located in back of manual.)

10–6. Heredity Versus Environment

This is the subject of much controversy. The inheritance of an individual can vary widely from that of his parents, since each parent cell supplies one-half of the 46 chromosomes that begin the new cell. Also, some characteristics are dominant and others are recessive. It is possible, therefore, for a family of high intelligence to have a child with low intelligence or vice versa. However, a child is more likely to have traits and intelligence similar to that of his parents. Environment, too, is different and variable. An infant deprived of love and affection from birth will have a slower mental growth than one that is read to, loved, "mothered," and kept comfortable. A child brought up in a family where a foreign language is spoken may seem stupid when he is entered in a school where English is spoken. Even the health of the mother before the child's birth affects his development. There are also physical differences between the sexes and between people of the various nationalities and races. Thus, many factors must be considered by nursing personnel who furnish patient care for children.

Section II. HOSPITALIZATION OF A CHILD

10-7. Admission Area

Within the limits of the military hospital environment, the pediatric admission area should be as bright and as cheerful as possible. Toys for various ages, a bulletin board with pictures or posters, well-chosen fresh magazines, small chairs, a small blackboard with chalk and erasers, and animal paintings or murals will all help entertain children during the waiting period. The room should also be well ventilated.

10-8. Admitting the Child

The medical specialist who assists in admission or admits the child must use every available means to make the child and his parents comfortable and welcome. He must have a friendly, reassuring manner as, in their eyes, he immediately becomes their host and authority figure and thus represents the type of future treatment that they can expect. He must remember, although he may have admitted dozens of children, that this may be the first time for the child and the parents. Superficiality and a real lack of interest will be spotted quickly by the child and his parents. Above all, speed must not subject the child to new experiences to quickly; he must be given time "to get acquainted." A few extra minutes spent in explanation may prevent misunderstanding and unhappiness. If possible, the child should visit the ward before admission. If the parents have not prepared the child, the specialist must take the time to explain what will happen and to reassure him.

a. Obtaining Information. The specialist who admits a child must be a skillful interviewer. The interview is not just a bare recording of facts but a real opportunity for communication with the parents and for quiet observation of them. The parent's address, manner of speaking, and dress can all give clues to their background if the specialist is alert, and he must find out as much as possible in order to give nursing care day and night. If the child speaks a foreign language, it would be wise to write down a few words of that language. If the child has been admitted before, the specialist should look at his old records and try to say something personal like "I see Tom has had a birthday since he was here" or "Betty was allergic to strawberries when she was here. Is she still avoiding them?" If the child has never been admitted before, the specialist should use SF 538 (Clinical Record—Pediatric).

b. Attitude of Parents. In pediatric nursing care, parents and other relatives need much more reassurance and explanation than in adult nursing care. In some instances the parents may be so afraid and worried that they either do not hear or do not remember. This means that explanations must be patiently repeated time and time again. Often a printed list of rules—the visiting hours, special rules for acutely ill children or those with contagious diseases, lists of prohibited food or gifts, etc.—may be given to the parents. Above all, contact between the parent, the hospital, and the child must be maintained. Remember that the parent is worried about the child and about the treatment he will receive.

c. Attitude of Child. You must remember that the child did not come to the hospital of his own free will and that the actual situation can be quite different from what he imagined. He is probably anxious and unhappy. He may feel guilty and think he is being punished by being hospitalized and deserted by his parents. You should place yourself in the child's position; how would you feel if you were sick and didn't understand why, afraid and yet the people you love most seem to desert you, alone in a strange place and surrounded by people in strange clothes? He deserves the utmost understanding because he may not be able to put his fears in words. Watch for signs that he is frightened, lonely, hurting, homesick. Above all, do not ignore a frightened child, scold an overactive one, or talk loudly in English to a child who does not understand it. Watch the faces of the child and his parents to get clues to their feelings. Remember, too, that crying is a way to express fears, so do not discourage it.

10-9. Consents

SF 522 (Clinical Record—Authorization for Administration of Anesthesia and for Performance of Operations or Other Procedures) must be signed by the parent before operations are performed or anesthesia is given.

Section III. SAFETY

10–10. Accident Prevention and Restraints

Accidents are one of the greatest hazards in the life of children. Negligence on the part of even one person can be disastrous, so all nursing personnel—and particularly those in Pediatrics—must be safety conscious and exercise day-by-day vigilance. Among other things, windows should be barred or well-screened and radiators, heating pipes, and electric wires should be covered or fixed so that children cannot reach them.

a. Bed. Since the child is too young to look out for himself or lacks the judgment and experience to do so, the medical specialist in the pediatric ward must be extraordinarily safety conscious. A child under 9 should be placed in a crib or a junior bed as appropriate for his size. If he must be placed in an adult-sized bed, the bed should have side rails. Children over 6, who normally during the day would not have side rails up on the bed, should have side rails up at bedtime and any time their condition warrants. Side rails should also be used for any patient who has seizures or paralyses. A young child can move with a speed that an adult can only estimate, so the crib side should never be left down even for a moment unless the specialist has a hand on the child to restrain him. Even with the sides up, a child can crawl out of bed and fall on his head, often fracturing his skull. If a child even attempts to climb the side, a crib net should be applied immediately. The ties are secured to the frame so that the child cannot reach them and so the sides can be lowered without disturbing the ties (fig. 10–1).

b. Extraneous Objects. The specialist should constantly watch for any object small enough to put in any body orifice (buttons, parts of toys, money) or for any sharp item and remove it at once. Safety pins should be closed and placed out of the reach of the child during diaper changing, but kept where the specialist can see them. Laboratory technicians must be watched to see that they do not leave such things as capillary tubes or lancets on the bed or bedside table. Bedside tables are kept clear of anything that can be reached by a patient, and special precautions are taken to be

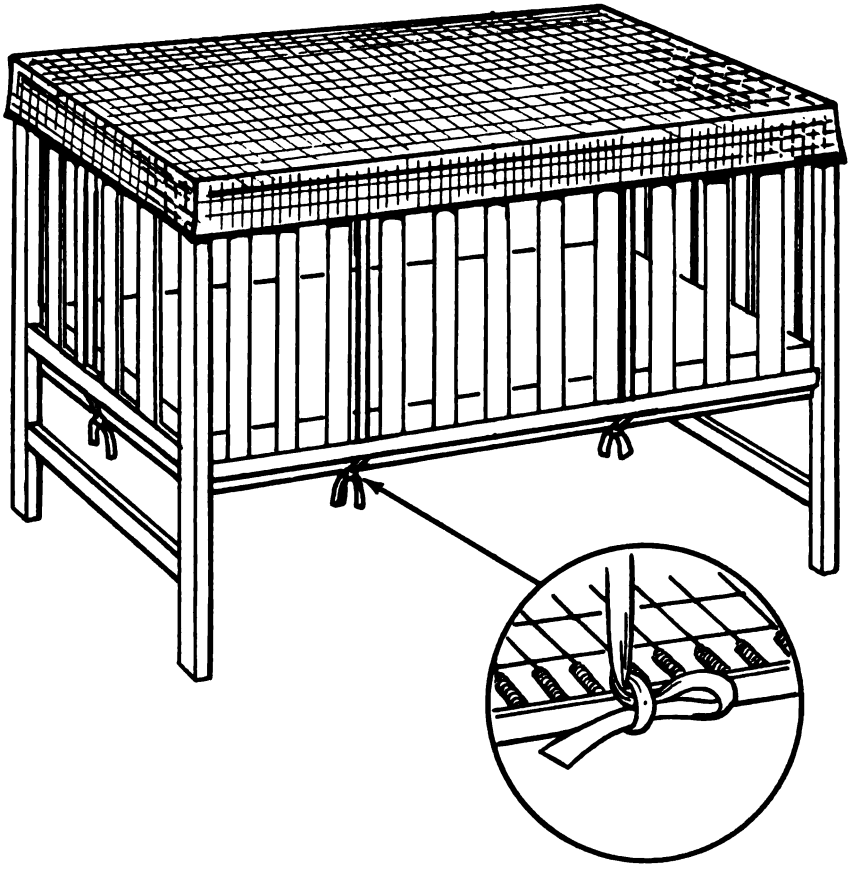


Figure 10–1. The crib net restraint.

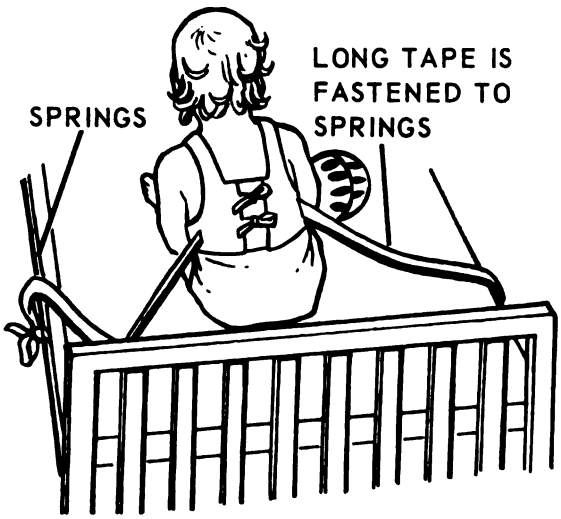


Figure 10-2. Jacket restraint.

sure objects cannot be reached by ambulatory patients. Plastic bags or pieces are not left where children can reach them; they can too easily smother a child. Special precautions are also taken to keep medications out of the reach of children.

c. Restraints.

- *The jacket restraint* (fig. 10-2). This may be used in place of the crib net restraint. It is put on with the ties in back so that the child cannot untie them.
- *The clove hitch.* This restraint is used when extremities must be restrained. When one arm or leg is restrained, the opposite one should also be restrained so that the child cannot injure himself by twisting or turning. A clove hitch is applied by making two loops and forming a figure eight (fig. 5-26), with both ends on top of the figure and pointing in opposite directions. Place soft padding around the part to be restrained, slip the loop on, and adjust to fit. Tie the ends to a part of the bed under mattress (fig. 10-2) (*never* to the sides of the crib, which might be lowered).
- *The mummy restraint* (fig. 10-3). Place a sheet or a blanket flat on the bed, then put the child on it with his shoulders at the top of the sheet and the sheet extending about 10 inches beyond his feet. Children who are restrained should be released at frequent intervals to give them respite.

d. Holding Techniques. A child must usually be held to examine his eyes, throat, and nose. The specialist stands at the head of the crib and brings the child's arms up against each side of the child's head, with the specialist's hands firmly on the elbow joints. Another technique that may be used to examine the ears is to turn the head to one side and flat against the bed. The specialist has one hand on the child's head and then uses the other to hold the child's hands.

e. Miscellaneous Safety Precautions.

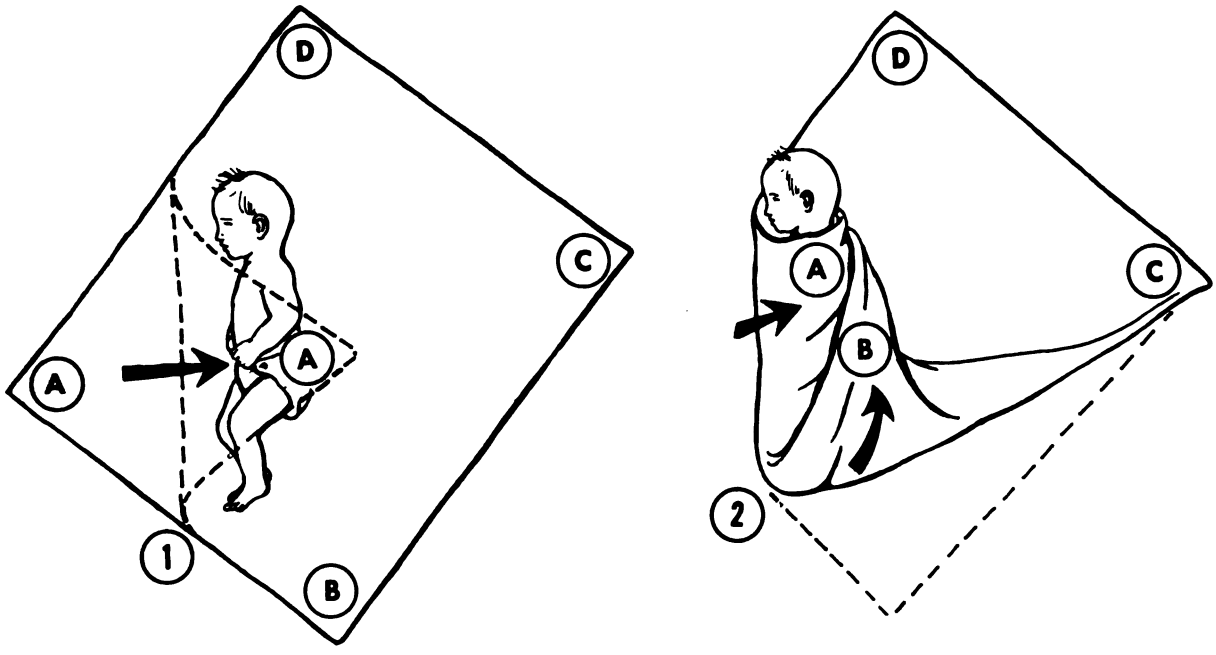
- Children should ambulate in approved area of the ward away from places where dangerous supplies and equipment are stored; e.g., treatment or utility rooms.
- Plastic bottles should be used for children who have their own bottles. Glass nursing bottles can be easily shattered against cribsides.
- Strings should not be used to tie bottles or objects to cribs. These are potential strangulation hazards.

10-11. Identification Bands

As with any other patient, the child must be identified. The clinical specialist must check the child's identification band each time before giving medications or treatment. These bands should list the name, hospital number, unit, and any other required information and be applied so as to avoid restricting circulation. Identification bands must be replaced when broken or lost, or when unable to read.

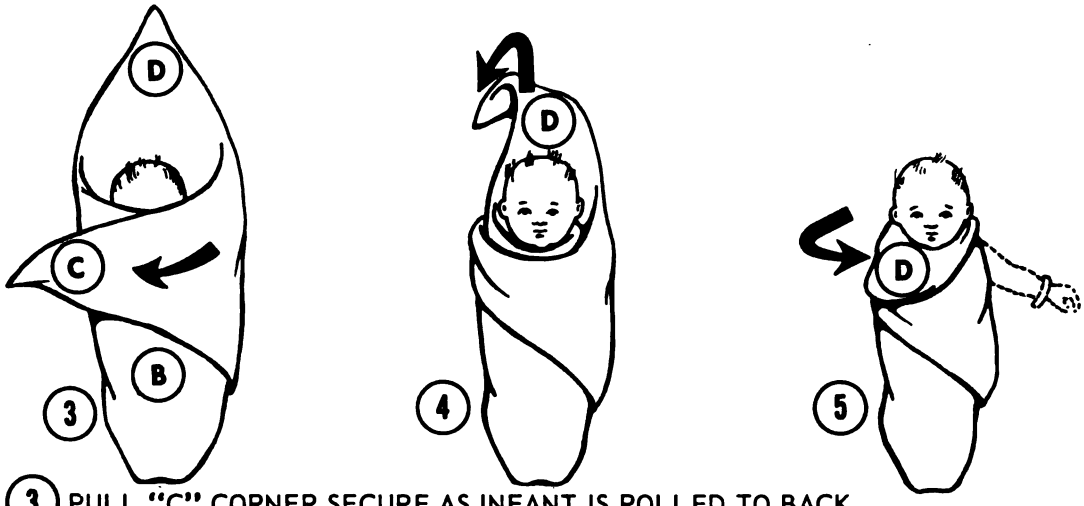
10-12. Toys

The toys used in a hospital should be safe—no sharp edges, flaky paint, or removable parts. They should also be clean and, preferably, nonspillable. When used for therapy, they should be durable, be interesting to the child, require a variety of motions to manage them, and provide mental stimulation. Play should be therapeutic. Care must be taken to see that small children do not play with toys intended for older children that are potentially dangerous to toddlers. Marbles, balloons, etc., are all dangerous to have on a ward. A bedridden child could have picture or drawing books, puppets, a ball on a string. Some toys with therapeutic value include toolbox (hand grasp, form perception, hand-eye coordination, supination, and pronation), clarinet (finger flexion and extension for older child), push-pull toys (imaginative play, walking, and crawling), rocking horse (helps maintain sitting balance, reach and grasp, arm movements), tricycle (hand grasp, leg exercise, dorsiflexion of ankle) and wagon (hand grasp, trunk control, dorsiflexion and plantar flex-



(1) PLACE CHILD ON SIDE FACING YOU, TUCK "A" CORNER SECURELY UNDER INFANT'S BACK.

(2) TUCK "B" CORNER BEHIND INFANT'S BACK, MAKING A PLEAT TO BRING BLANKET TO SHOULDER LEVEL.



(3) PULL "C" CORNER SECURE AS INFANT IS ROLLED TO BACK.

(4) HOLDING INFANT UNDER THE ARM AS IN A "FOOTBALL–CARRY," HOLD "C" CORNER WITH HAND SUPPORTING INFANT'S HEAD.

(5) WITH FREE HAND, PULL "D" CORNER DOWN OVER INFANT'S BACK AND SHOULDERS, SECURING LOOSE END OF "C" CORNER AND FREEING INFANT'S HEAD AND FACE. ARM MAY HAVE IDENTA–BAND OUT OR BOTH ARMS MAY BE SECURED. INFANT CANNOT WRIGGLE FREE, SINCE BLANKET MAY BE LOOSENED ONLY BY FIRST RELEASING "D" CORNER, PULLING IT UP OVER INFANT'S HEAD.

Figure 10–3. The mummy restraint.

ion of ankles, and hip and leg extension and flexion). Toys can also be used to teach color, size, and shape discrimination.

10–13. Shoes

a. Regular Shoes. An infant's foot is flexible, so shoes should not hamper the foot's normal functions. The toddler should wear shoes with firm soles that fit the shape of his foot but are at least ½ inch longer and ¼ inch wider, with securely fitting heels. For the school child, shoes should be sturdy and of the correct size. Particular care should be taken to insure that a diabetic child's shoes are replaced as often as he grows.

b. Shoes for the Pediatric Hospital Patient. Scuffs are not practical for small children. The parents should bring regular bedroom slippers if at all possible. These should not have smooth soles, or the child may slip and fall. If no bedroom slippers are available, it is best to have the child use his regular shoes while in the hospital.

10–14. Parents

Parents have been known to bring bags full of candy to the hospital. Check bedside stands frequently to make sure that children are not eating candy to the exclusion of properly nutritious food. Because children will often share these "goodies" with those who are NPO or have diabetes, candy and gum should not be permitted on the ward. Also, parents of older children may bring in potentially dangerous toys for the younger ones. Tactfully explain the danger. Most parents will be cooperative.

★Section IV. BASIC NURSING CARE

10–15. Temperature of Room

For the newborn, the temperature of the room should not go below 68° F, as he has an unstable heat regulating system. The temperature should be checked each tour of duty and should be fairly constant at 72° F with a relative humidity of about 40 percent.

10–16. Baths for Newborn Infants

The infant must be protected from sources of infection, so use strict aseptic techniques.

a. Assign a crib exclusively to one infant so that he will not be exposed to cross-contamination.

b. Give routine baths in this crib. Tub baths are given when approved by the doctor but are not given before the cord falls off (usually occurs within 1 week after birth).

EQUIPMENT

Chux, soft cloths, or cotton balls
Thermometer
Diapers
Sterile cotton pledgets
Clean bed linen
Sterile metal prep basins for bathwater
Water at 100° to 105° F
Hexachlorophene solution added to water if ordered

PROCEDURE

1. Wash your hands.
2. Before removing clothes, bathe the infant's head and face. Clean the ears around the fold with sterile cotton pledgets and warm water, but do not enter the ear canal.
3. Cleanse one eye by stroking from the inner canthus outward with a clean damp cotton ball soaked in sterile water. Then use a different one to clean other eye. Do *not* use applicator sticks to cleanse the ears, nose, or other orifices.
4. Expose only part of the infant's body at a time to avoid chilling.
5. Test the bathwater with water thermometer. Temperature should be between 100°–105° F.
6. Wash the skin in the creases of the body daily with tap water, beginning at the neck. Use approved solution to wash any area where dried blood or secretions are present. Soap may be used for older infants.
7. Give special attention to the genitalia.
   a. *Male* (uncircumcised). Gently retract, cleanse, and *replace* the prepuce of the penis. Paraphimosis (impaired circulation to the uncircumcised penis due to the retraction of the foreskin beyond the corona) may result if the prepuce is not replaced.
   b. *Female.* Cleanse labia from front to back to avoid contamination of vagina or urethra with feces.
8. Apply topical application of a prescribed solution to a weeping cord stump. (In this case,

be sure the diaper is below the cord so that urine spreading on the diaper does not reach the cord.) Isolate any child with such an infection.

9. Apply approved baby oil to dry or cracked areas. Do *not* use powder, which can be inhaled or which may irritate the skin. Powder is rarely used in hospitals.
10. Use a receptacle for soiled clothing. Do not put on side of crib or on floor.
11. Dress the infant.
    a. *Diapers.* Place ½ of the folded diaper under the infant's buttocks. Draw the rest over his lower abdomen and pin securely at the sides (holding your hand between the diaper and the infant to avoid sticking him). Always point the diaper pins outward (fig. 10–4); in the event they come unfastened, the chance of injury is lessened. Be sure the diaper is secure around the leg area as feces can contaminate the bed linen and his fingers. In diapers, males need extra thickness in front; females, in the back. Do *not* use plastic or rubber pants as they retain heat and encourage urine stagnation. If a rash is present, leave the buttocks exposed to air.
    b. *Sleeves.* To put an infant's arm through a sleeve, put your fingers through the bottom of the sleeve, grasp the baby's hand through the armhole, and gently pull the sleeve up toward the baby's shoulder.
    c. *Socks.* These should be ½ inch longer than the infant's foot and may be advisable not only in winter but all year. Since circulation has not been completely established, the hands and feet may be colder than the rest of the body. If socks are not available in hospital, suggest parents bring them in from home.

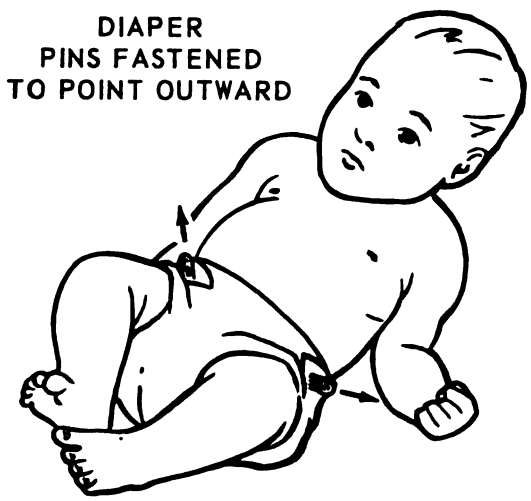


Figure 10–4. Diaper pin fastening.

10–17. Bathing a Child

OLDER INFANT

1. Use an infant's bathing tub or an oblong enamel tub. A washcloth under his buttocks makes a baby feel more secure if a metal tub must be used.
2. Use tepid (95° F) water, but do not fill too full.
3. Bathe the face, nostrils, neck, ears, and scalp before undressing the child.
4. Remove the diaper and cleanse the buttocks.
5. Remove rest of clothing and cover with a bath blanket. Soap without exposing child.
6. Carefully and gently lift him into tub by grasping both ankles with a finger between the tarsi, supporting head and neck in crook of opposite arm, with hand grasping infant's arms just below the shoulder. His smooth wet skin will be difficult to hold and he will probably be attempting to kick or wiggle. Use extreme care. Do not let him slip or frighten him by plunging him into the tub.
7. Support his head, neck, and body with one hand and forearm.
8. Gently rinse all soap off.
9. Lift the child gently and slowly out of the tub as you held him to put him in.
10. Wrap in a soft bath blanket; gently pat dry. Dress him.

CHILD

1. Up until about 7 years of age, the child requires supervision and assistance in bathing (for example, most 6-year-olds can wash their arms, legs, and faces but need help with the rest). He should be helped in and out of the tub and the specialist should remain in the room. Hot water is never turned on after a child is in the tub because of the danger of burning him.
2. By 7 years of age, the child can bathe himself fairly well and does not need much supervision, although boys may dislike baths. A tub bath for the older child is similar to that for an adult.

10-18. Care of the Hair

Inspect head thoroughly upon admission and frequently thereafter for nits, pressure sores, cuts, bruises, or other abnormalities. Comb the child's hair at least once a day gently. The restless child's hair may mat. If it does, hold a section of the hair near the scalp to prevent pulling and gently untangle the hair below. Give a weekly shampoo to a child and a daily one to an infant, if the child's condition permits. Be careful not to get soapy water in any child's eyes or ears, or over his face as it may frighten him. Quickly dry the hair with warm towels or a hair dryer.

10-19. Mouth Care

Insure that the older child brushes his teeth daily, using the same technique as for an adult (para 5-21), unless contraindicated. Offer the infant sterile water between feedings.

10-20. Feeding a Child

a. Bottle Feeding.

(1) Feeding the newborn depends upon the physician's preference. Feeding usually begins from 12 hours to 3 days after birth. The infant should always be clean, warm, and dry when fed. He is held in the same position, whether breastfed or not; that is, he is picked up and held with his head and back supported. A bottle should never be propped in baby's mouth as this can cause aspiration of the formula.

(2) If he is to be bottlefed, wash your hands. Get the formula from the refrigerator and check the name of the infant with the name on the bottle or insure that the correct formula is given to the infant. The formula should be given at room temperature. Put on a gown before feeding the infant and also put a quilted pad on your lap for protection. Hold the baby, giving sturdy support to the head and back. Infants that are held so that they are partially upright swallow less air. The holes in the nipple should be small enough to prevent choking but large enough to let the milk come through with some sucking. If the infant becomes frustrated and angry when fed, first check the size of the nipple hole. When the bottle is held upright, the milk should fall slowly in drops, not in a steady stream. Also hold the bottle so that the nipple is always filled with milk. The atmosphere must be calm and unhurried during the feeding; you should allow a half hour for each feeding. Watch how the infant takes his formula. If he takes it eagerly and hurriedly, he should be burped for every ounce consumed as a minimum and at the end of the feeding. To burp the infant, sit him up with his head tilted slightly forward and his head and chest supported by putting your fingers over the mandible bone of the face, and gently pat his back. This will permit you to observe him. After feeding, place him on his abdomen or right side to help empty the stomach and prevent regurgitation and aspiration.

(3) Record the type of formula, amount taken, and amount retained.

(4) After use, rinse the nipple and bottle with running water.

(5) Suspect underfeeding if the infant fails to gain weight. In the hospital, babies are usually weighed before their morning baths and a record kept of the daily weights.

b. Transition to Cup Feeding.

(1) Feed the baby from a small cup or training cup for a short interval at the beginning of the feeding period. Never use force to make a child eat; stop the cup feeding when the child gets tired.

(2) Begin any new food gradually. The infant should just be given a taste (½ to 1 teaspoon) the first time and then early in the day. A new food is NOT introduced when a child is tired or fretful nor if the person doing the feeding is a stranger to the infant.

c. Food. Feeding regimens vary greatly according to the doctor's preference and the area of the country, as well as with the current trend. The following general comments can be considered as basic. Vitamins are usually added to the infant's diet the second week. Water and orange juice are soon added and then cereal and baby foods. Solid foods are usually begun with cooked or preprepared cereals (may occur at 3 to 6 weeks after birth). Solid foods are always offered before the formula. Sometimes it may be necessary to mix the cereal with the formula to get a desired consistency. Feed cereal (and other solid foods) with a spoon, not in a bottle. After cereals, yellow fruits are usually added to the diet, followed later by infant pureed vegetables. These foods should be fed individually rather than mixed together, so that the baby will learn the taste of each. When pureed foods can be handled well, junior foods are added to the diet.

CAUTION

Two new foods are not started at the same time; several days should elapse.

Commercially prepared food will be available on

the ward, but a specialist may have to mix certain foods. (Before opening a can or jar of baby food, wipe the top clean to avoid contaminating the food when opening the container.) When teeth appear, the infant is usually given crackers, zwieback, or hard toast. By 1 year, he should be getting whole milk, cooked cereal, strained cooked vegetables and fruit, well-ripened banana, egg, meat juice and scraped meat, orange or tomato juice, and additional vitamins. Chopped foods are started about 14 to 18 months when he has enough teeth to chew. He should be encouraged to eat slowly and to chew thoroughly. As soon as he indicates a desire to feed himself, get two spoons. Permit him to lift one spoon to his mouth, but give him help in filling it. He will spill some at first, but he will soon learn how to hold the spoon. Praise his successes. Meanwhile, use the other spoon to feed him while he is experimenting. Serve the food at the moderate temperature he prefers—never hot or cold. Sometime between 2 years and 30 months he should learn to take solid foods. Finger foods such as carrot sticks or bacon are especially good from this age through about 4 or 5 years of age. Older children generally are served adult food in a pleasant, happy environment. Exercise particular care on the ward to see that sweets or large amounts of fluids are not ingested before meal time. However, in certain cases, one of your most important duties may be to see that the child has a high fluid intake. You should offer gelatin, carbonated beverages, Kool-aid, popsicles, water, and fruit juices. Vary the container as well as the fluid. Use small different-colored paper cups. Let a girl pour a drink from her doll's teapot. Make use of surprise and novelties. Have a child cut out a glass from colored paper and paste on a large paper for every glass of fluid. For variation, offer fluids in a bottle with a straw, unless contraindicated. Whatever you do, serve fluids and foods attractively and in small servings. Daily personal touches and surprises can also help make a sick child more interested in eating. Ask parents, volunteers, and visitors to encourage the child to drink and to help you devise games to stimulate fluid intake. Even if he needs extra fluids, however, do not give large amounts just before a meal.

10–21. Observation of Vital Signs

a. Normal signs are as given below:

Age	*Pulse*	*Blood Pressure*	*Respiration*
0–1 year	120–140	80/50	40–60
1–4 years	100–120	94–100/64	24–36
4–10 years	100	100/60	20
10–14 years	80	114/60	15–20

b. Signs and symptoms.

(1) *Pulse.*

- Full and throbbing—fever, patent ductus arteriosus, aortic regurgitation.
- Pulsus alternans (alternately strong and weak)—danger sign of heart failure, tension pneumothorax, cardiac tamponade.
- Rapid, weak, or fluttery—shock, cardiac failure, respiratory trouble, blood loss.
- Weak or absent in lower limbs—coarctation of aorta.
- Irregular, then absent—atrial fibrillation.
- Unusually slow—overdose of digitalis or heart block.
- Less than 40—may have unconscious spells.

(2) *Blood pressure.* (Use a cuff of ½ to ⅔ the size of the child's upper arm—the wrong size cuff will give a false reading.) Blood pressure on a child is taken only when specifically ordered by the doctor—generally on children with previous abnormal readings. Those with serious heart disease, and those in the postoperative period. Agitation or fright can increase the BP, so the specialist should explain and perhaps demonstrate on another cooperative child how it is done, or distract the child with a toy. Babies can be given a bottle of milk or a pacifier for calming purposes.

(3) *Respiration.*

- Increase of 10 per minute in a quiet sleeping child—sign of trouble.
- Labored breathing, flared nostrils, restlessness, fear—sign of cardiac failure.
- Tachypnea (excessive rapidity in breathing) in infant—may be only sign of early heart failure.
- Change in rate—important.

(4) *Temperature.* Up to 6 years of age, a child's temperature is usually taken rectally, with the child prone and the thermometer inserted 1 to 2 inches (depends on the patient's size) in the rectum and directed toward the umbilicus. Regardless of age, rectal temperatures should be taken on any patient whose condition warrants it, such as patients who are disoriented, have respiratory difficulty, or are mentally incompetent. The specialist holds the thermometer in place for 2 minutes, regardless of how reliable the child appears. Anything above 99.6° F. is considered fever. Over 6 years of age, the temperature is taken orally—but even then the specialist must stay with the patient until the thermometer is removed. The normal reading for an oral temperature is 98.6° F.

10–22. Intake and Output

The importance of adequate intake and output

records has been discussed in chapter 5. It cannot be overemphasized.

a. Urine. Unless the doctor specifies otherwise, "Barely damp diaper—voided small amount" or "saturated diaper—voided large amount" for an infant are accurate enough for the record. The diaper may be weighed before and after urination. The weight in grams is considered equal to mls. for an accurate urine output. Regardless of age, no child's output should be less than 10 ml. per hour. Sometimes, as in peritoneal dialysis, an hourly accurate intake and output record must be kept and any change in output reported. These records are also extremely important when a patient has been burned, as renal failure can occur. The hourly urine output indicates circulating blood pressure as well as kidney function.

b. Stools. A description of the stool can be important such as "large amount of soft yellow stool" or "small amount of soft formed brown stool." If the stool is green and watery (may have diarrhea) or small and hard (may be constipated), report it to the nurse. The newborn infant will have two to four stools in a day, up to one with each feeding.

★Section V. MEDICATIONS

10–23. Rules for Medications

Follow the rules for medications given in table 4–5.

10–24. Administration of Medications

Special knowledge is required to administer drugs to children because they can react quickly and violently to medication. The specialist who is authorized to give medication to children must be aware of toxic side effects that might occur. A specialist never computes nor gives fractional doses of medication.

GIVEN TO A CHILD

1. Be firm, but kind, when you give a child his medication. Never let any doubt creep into your voice. He doesn't have any choice, so say something like, "Timmy, take your pill with this fruit drink." If he is under 5 years, he does not know how to swallow a pill. You can use two approaches to make it palatable:
   a. Give it suspended in syrup.
   b. Crush the tablet out of the child's sight and disguise it in a large spoon or two of strained fruit.

CAUTION

Do not put medications in a bottle of water or milk. Part of it might be refused and you would not know how much drug was ingested.

2. Identify the patient. If the child can talk, ask him his name (you never say his name yourself because he may say yes to any name). You also check his identification band. If the child is too young to talk, check his identification band and check the location (room number, ward, bed number) and the bassinette or crib tag.
3. Be prepared to answer questions like "Does it taste bad?" Answer honestly.
4. Be prepared to deal with delay. The child will delay you as much as possible. You may have to ask him if he is going to take the medicine or if he prefers that you give it to him.

CAUTION

- NEVER hold a child's nose to give medicine.
- Do NOT give medication when a child is crying; he might choke or aspirate.

5. Make sure that oral medications are swallowed. A souffle cup can be used with a toddler. You can compress it slowly and expel the medicine into the child's mouth.

GIVEN TO A INFANT

Use a calibrated eye dropper to give oral medications to infants.

1. Raise the infant's head and depress his chin with your thumb. This will open his mouth.
2. Using eye dropper, drop the liquid slowly on the middle of his tongue. Use a rubber tip on the dropper to avoid contact of the glass with the lip. If this is done, the baby can be permitted to suck and swallow the liquid slowly.
3. Now, raise the infant's chin and let him swallow.
4. Be sure all the medication has been swallowed before putting the baby back in his crib.

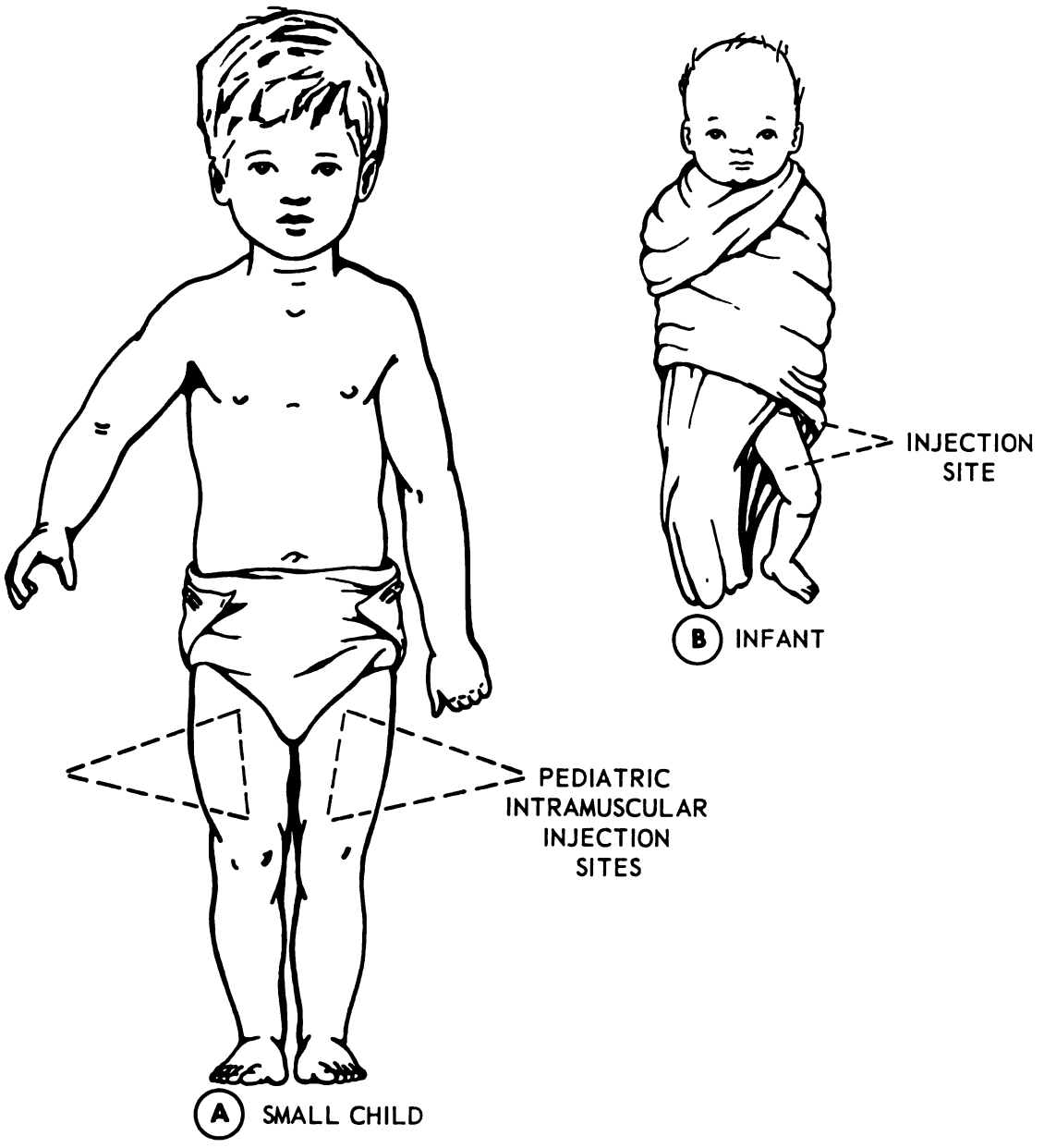


Figure 10–5. Position for administration of intramuscular injection.

RECTAL MEDICATIONS

Children's suppositories are a different shape from the cone-shaped type used for adults; they are long and thin.

1. Put on rubber gloves or a finger cot.
2. Insert the lubricated suppository about one-half as far as the forefinger will reach.
3. Gently hold the buttocks together for a few minutes to keep the child from expelling the suppository.

10–25. Injections

Important: It is difficult to control the movements of children, especially from 1½ years to 9 years. Even a quiet, cooperative child may jump or move unexpectedly. Safety requires that two people give the injection: one to restrain the child and the other to give the injection.

a. Feed a baby first or he may be too upset to eat.

b. Mix drugs in a syringe when possible in order to cut down on the number of injections. Never draw up an injection where the child can see you; seeing the needle may increase his anxiety. Never tell a child that an injection will *not* hurt.

c. Inject into the anterolateral (quadriceps muscles of midanterior thigh) aspect of the thigh (fig. 10–5) for an infant and small child to avoid nerves and to help absorption, which is more effective than by injection into the buttock. However, use the buttocks for older children as the nurse directs.

d Use same injection technique as for adults but give as quickly as possible.

e. Pick up an infant or small child and cuddle him after the injection.

f. Rotate injection sites.

g. Do not exceed the prescribed volume of injection for child's size.

★Section VI. CHILDHOOD SURGICAL CONDITIONS AND ILLNESSES

10–26. Changes in Physical Condition

Changes in a child's physical condition can be rapid and extreme. Nursing care personnel must keep close watch on an ill child for signs and symptoms, especially of the following:

a. Fever. This is probably the most common symptom seen in children. Up to 3 years of age, the greatest danger of prolonged high fever is that it may cause a spasm or convulsion. Even when old enough to talk, children will rarely mention that they feel "hot" or "cold," so the specialist must be ever watchful for signs such as an increase in redness of the cheeks or brightness of the eyes, twitching of muscles, or an increase in radiation of heat from the patient. If these signs occur, the temperature should be taken immediately, as a child's fever can shoot up suddenly and dramatically. When a doctor orders that measures be instituted to reduce a fever until it reaches a certain figure, the specialist must check with the nurse about the type of cooling measures to institute, as doctors vary in their preference of methods. The specialist must realize that these procedures take precedence over all routines, and he must accomplish them immediately. He must also notify the doctor or nurse if the fever does not go down within 30 minutes to 1 hour. Of special importance here is accurate charting on SF 537 (Clinical Record—Pediatric Graphic Chart).

b. Chill. The patient has uncontrollable shaking or shivers, and the skin may become blue and mottled. Although gose pimples may occur and the child's teeth may even clatter, this is not always true, especially with infants. Application of heat usually does not help, although it must be tried. The specialist must time the duration of the chill and report its length and severity.

c. Sweating. This is accompanied by a drop in temperature. Excessive sweating all over the body is not generally normal and should be reported. The specialist watches for excessive sweating and, when it occurs, keeps the child protected from drafts and dry, regardless of the work involved.

d. Convulsions. A convulsion occurs much more frequently in a child than in an adult. The tonic type (stiffened position) is most common in an infant. Since a convulsion's onset is quick and violent, a specialist must stay with the patient and call for help, yet be prompt and remain cool in taking the following actions:

(1) If the child is lying down and, if possible, first place a gag between his teeth so that he will not bite or swallow his tongue. If the teeth are clenched tightly shut, do not attempt to insert mouth gag because of danger of breaking teeth or dislodging loose teeth. If the child is not lying down, place him so that he is, but elevate his head a little. If on the floor, support head to prevent trauma.

(2) Note the symptoms and duration. The specialist should know if the convulsion was preceded by an aura (sound, smell, or a sensation of cold air rising to the head—this information can only be obtained from an older child) or an emotional disturbance, the area of the body involved, which muscles were first affected, the type of muscular contractions, color of the patient, relaxation of bladder or anal spincter, degree of consciousness (if any), expression on the face, size of pupils of the eye, frothing from the mouth, and the number of convulsions.

(3) Keep the child warm. If a child is known to be convulsive, his bed should have padded rails and should be placed where he can be observed constanlty. A padded gag should be put where it can be easily reached. Oxygen and suction must also be readily available. His tys should be selected caefully to avoid those that might cause him injury during a convulsion.

e. Vomiting. Nausea may precede and follow vomiting, but a small child seldom complains of nausea; however, yawning, sweating, paleness, and restlessness may be signs of its presence. The specialist must observe, record, and report the appearance of the vomitus. Look for the presence of undigested food; presence or absence of bile; odor, especially a fecal odor; and presence of bright red blood or "coffee-ground" vomitus. The

type of vomiting should also be reported as projectile (an explosive type where the stream may travel 3 to 5 feet) or nonprojectile (a milder type where the stream does not travel over 12 to 15 inches). Vomiting is always accompanied by forceful contractions which do not occur with regurgitation or "spitting up." The specialist must be aware, too, that some children can vomit at will or when too full, anxious, or angry. Vomiting may also be an attention-getting device.

f. Pain. Children must be observed closely for signs of pain such as frowning, dilated pupils, and drawn lips. If a child insists on a certain position, becomes less active or inactive, presses a particular portion of the body, or shows symptoms of muscle rigidity, pain should be suspected. Pulse and blood pressure can also be indicators, usually rising with pain (exception: *severe* pain). You cannot rely on a child's word description of his pain; ask him to point where it hurts. Even this may not work—often the child cannot identify the area of pain. The specialist must be sure to record the time the pain began and its duration.

g. Respiratory Distress. Another cardinal symptom of trouble is difficulty in breathing. It is frightening to be deprived of adequate oxygen and particularly so to a child. This is a common emergency with a child, so suction equipment, laryngoscopes, tracheostomy tubes, and like items, should always be readily available on a pediatric unit. Respiratory distress, such as dyspnea, cyanosis, sternal retractions (indrawing of the suprasternal notch, epigastrium, and intercostal spaces), grunty respiration, and stridors (harsh, high-pitched whistling sounds), are danger signals, and a nurse or a doctor should be notified at once.

h. Other Signs and Symptoms. These include crying, particularly a weak or inaudible cry; coughing; restlessness, hemoptysis (spitting blood), anorexia (refusal of all or some foods); pulse and respiration; constipation, diarrhea, and melena (dark feces caused by blood pigments); hemorrhage; shock; distention; regurgitation ("spitting up" food) or rumination (intentional regurgitation and reswallowing of regurgitated food); jaundice; and lethargy.

10-27. Conditions of Infants and Small Children

These conditions are *usually* found in children under two years of age.

a. Erythroblastosis Fetalis (Rh Incompatibility). This is excessive destruction of the red blood cells of the baby because of an incompatibility with the red blood cells of the mother. Symptoms include anemia and jaundice. An exchange transfusion, followed by small transfusions later, may be ordered. The specialist keeps an accurate record of the amounts of blood withdrawn or injected and watches the baby afterward for jaundice, cyanosis, edema, convulsions, lethargy, vital signs, and changes in urine.

b. Croup. Croup (sometimes called spasmodic laryngitis) is a common childhood respiratory infection. It is characterized by hoarse cough, noisy inspiration, and struggle for breath which may be accompanied by moderate to severe retractions. Attacks occur mostly at night. The doctor may prescribe an emetic to cause the child to vomit, which helps to reduce the larynx's muscle spasms. Electric steam inhalators may be used, but croupettes are preferable from the standpoint of comfort and safety.

c. Diarrhea. This is characterized by a sudden onset with nausea, vomiting, chills, loose stools, abdominal pain, fever, and prostration. Diarrhea is a severe disease in any child and extremely severe, often fatal, for an infant. The stools usually have mucus and may have blood as the disease progresses. The greatest danger is dehydration and acidosis. A close intake and output record must be maintained. The electrolyte balance must also be maintained, as severe loss of potassium may accompany the disease. The doctor will usually order antibiotics and may order gastric lavage, paregoric, or parenteral fluid therapy. Nothing by mouth except water is also a common order for the first 24 hours. As symptoms disappear, liquids and soft diets are usually ordered. Disinfection procedures must be followed throughout the course of this disease.

d. Strabismus.

(1) This condition, also known as cross-eye, is a deviation of the eye that the patient cannot overcome and may be congenital or acquired. One eye or both eyes may deviate. Treatment usually begins before the child is 2 years old; the good eye is covered so the child must use the deviating eye. This eye defect may affect the child's personality, since the other children may make fun of him. If an operation is necessary, the child should be told that his eyes will be bandaged when he awakes from the anesthetic. Necessary restraints are applied before the child reacts but are removed afterward if he is old enough to understand and follow instructions. The child will usually be released within a day or so after the operation.

(2) With both eyes patched, the child will need much assurance. As you approach the bed, speak to him and explain what you are doing. Do not suddenly walk up to him and lower the bedside rails, as this would startle and frighten him. He will also have to be fed.

e. Otitis Media. This infection of bacterial or viral origin is common among infants because their eustachian tubes are almost straight and are wider and shorter than at anytime in their life. Symptoms include elevated temperature, pulling or rubbing the ear, turning the head from side to side, restlessness, vomiting, and crying. If an abcess forms, the eardrum may rupture and pus drain from the ear.

f. Intertrigo (Diaper Rash). Intertrigo is caused by prolonged contact with wet diapers. The treatment usually consists of exposure of the buttocks and perineal area to air and to light from a 25-watt light bulb at least 3 times. This bulb should be high enough to prevent the child from reaching it. Application of ointment may be ordered. If so, a diaper is applied and the heat lamp not used. Intertrigo can be prevented by frequent changes of diapers, washing of skin at the time of diaper change, and correctly washed diapers. Plastic diaper panties retain heat from urine decomposition and can cause or aggravate diaper rash. They should not be used in a hospital unless a physician or a nurse orders them in a special case.

g. Infantile Eczema. Infantile eczema is an inflammation of the skin. The lesions form vesicules (small blister-like lesions) and the baby scratches because the itching is unbearable. The infant's arms must be restrained, which causes frustration. He will need cuddling because of this. The doctor will order an ointment and solution to be applied and may order an emollient bath such as oatmeal or a mixture of corn starch and baking soda. The specialist puts the prescribed emollient in the water while it is filling and stirs it to mix it evenly. Before shutting off the faucets, he runs some cold water through them to cool them so the baby will not get burned if he grasps them. The bath temperature should be 95° F., but hot water is NEVER added after the baby is in the tub. He is usually kept in the tub for about 20 minutes but is NEVER left alone. If wet soaks are ordered, a gauze bandage is dipped in the solution ordered, squeezed gently to remove any excess, and then applied. These soaks must be kept wet. They are not covered with towels or rubber sheeting because evaporation cools and helps to relieve the itching. Wet compresses are applied to the face by using a square piece of gauze with places cut out for eyes, nose, and mouth. Four strings are attached to its four corners. The wet mask is then put in place and tied. Ointment, if ordered, is applied evenly and reapplied as needed. This is usually done by using the hand, rather than a tongue depressor.

h. Circumcision. This is the surgical removal of the foreskin of the penis. The care depends upon the doctor's orders. Generally a specialist will look at it every 15 to 20 minutes for the first 2 hours after the operation to check for bleeding. Diapers are kept in place and changed frequently for 48 hours after surgery. Voiding of any type must be reported to the nurse (urination may cause pain at first, and an older child may attempt to avoid it as long as possible). Petrolatum gauze is applied and changed p.r.n. to keep dressing moist.

i. Intussesception. This is a condition in which part of the intestine telescopes into another. It is more frequent in males and in children under two years of age. The primary symptoms are drawing up the leg, vomiting, and passing a stool with a mixture of blood and mucus. Postoperative nursing care is the same as for any bowel operation: fluid therapy, frequent determination of pulse and respiration rate, change of patient's position to side, care of nasogastric tube, and other necessary care. Suction and oxygen are kept available. The three most common complications are diarrhea, peritonitis, and high fever. The specialist must be particularly careful to prevent exposure to other patients with diarrhea.

j. Pyloric Stenosis. A condition in which the muscular tissue of the pylorus thickens and hardens, constricting the size of the opening from the stomach to the duodenum. As it progresses, partial or complete obstruction may occur. The primary symptom is projectile vomiting with no sign of nausea. Treatment may be medical or surgical but, regardless of the type of treatment, the specialist must keep an intake and output record. The appearance and color of vomitus should be noted. The amount vomited should be measured accurately, especially if a baby is to be re-fed. If atropine or methscopolamine nitrate is used, the specialist must watch for flushing and record it. The techniques for properly feeding a baby (always hold a baby to feed him; never prop a bottle) should be followed, with particular attention to calm, unhurried feeding. These babies tend to eat too fast, so their rate of eating must be slowed. In

postoperative care, the child's color, respiration, and pulse are watched.

10-28. Conditions of Children

These conditions are usually found in children over two years of age:

a. Greenstick Fractures. These are the most common fractures of children. A greenstick fracture is an incomplete fracture with one side of the bone broken and the other side bent. This type of fracture occurs because children's bones are soft and flexible and more prone to splinter. Simple and compound fractures can also occur, however.

b. Breakage of the Femur. Breakage of the femur (thigh bone) is one of the most serious breaks. Bryant's traction is used for small children (usually under 2 years of age). It is similar to Buck's extension but the legs are suspended vertically (fig. 10-6) with the buttocks barely clering the bed. A restraint jacket may be used to keep the child from turning. The specialist watches the ropes to be sure they are in the pulley grooves. The pull of the weights must not be obstructed, as they must hang free. He checks the child's toes often to be sure that they are pink and warm. He gives the child plenty of fluids and food high in roughage content to insure good elimination. He also entertains with records and stories. Parents are encouraged to visit the child.

CAUTION

Be sure to keep side rails of the crib up.

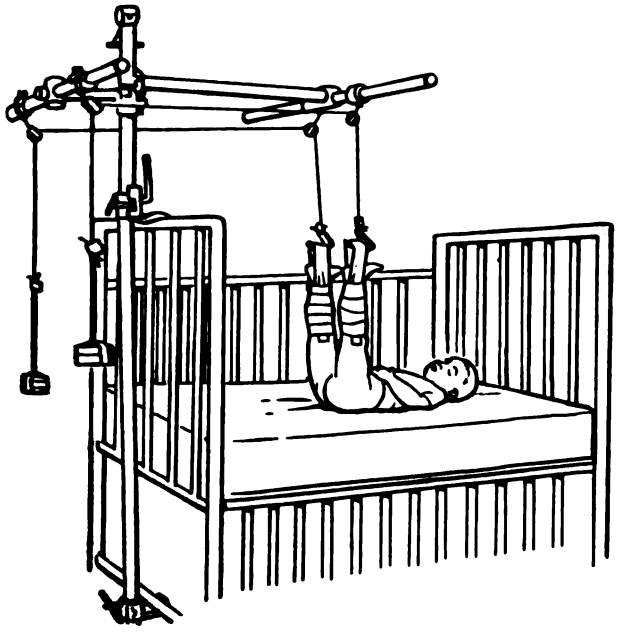


Figure 10-6. Bryant's traction.

c. Infections of the Eye. Among common childhood eye infections are *styes* (an infection of an eyelash follicle or a sebaceous gland of the eyelid), *chalazion* (an obstruction of the meibomian gland in the eyelid), *conjunctivitis* (which is inflammation of the conjunctiva), *keratitis* (inflammation of the cornea), *glaucoma* (an increase in intraocular pressure due to interference in the flow of aqueous humor), and *blepharitis* (an inflammation of the eyelid).

d. Injuries to the Eyes. Among these types of injuries are burns, foreign bodies, lacerations, trauma without entrance of a foreign body (such as a black eye), and sympathetic ophthalmia (where a good eye becomes inflamed after the other eye has been injured).

e. Cataract. A cataract is an opacity of the crystalline lens of the eye, its capsule, or both. Cataracts present at birth are called congenital. Although most congenital cataracts are hereditary, they may be caused by virus infections; for example, German measles if contracted by the mother during the first three months of pregnancy. Operative procedures differ with the age of the patient and type of cataract. Postoperative management of the child following cataract surgery will include protective measures such as elbow restraints to keep him from rubbing the operated eye. If the patient has both eyes bandaged, the specialist must be aware that unexpected activities and loud noises such as touching the child without first speaking to him or lowering siderails without warning may frighten him. The amount of activity permitted following surgery will be determined by the surgeon.

f. Tonsillectomies. As with an adult operation, the child is admitted the day before the surgery so that he can have a complete physical and the various tests made. He is observed for any signs of an upper respiratory infection or loose teeth. Foods and fluids are withheld (NPO sign may be on bed and child). The specialist checks to see that the child's identification band is securely attached. The child should void before leaving the ward. Any strange procedures such as being pushed on a stretcher are explained. After surgery the child is placed in a prone position with a pillow under his abdomen or chest to aid in drainage and to prevent aspiration. He may swallow a great deal of blood if not watched closely. When he regains consciousness, he is turned over and supported in a semisitting position. He is watched for any evidence of bleeding (restlessness, frequent swallowing, etc.) as hemorrhage is the most

common complication. Delayed bleeding can occur hours after surgery so his vital signs must be checked frequently. His gown and bed are changed as needed. He is given small amounts of liquids if he is not vomiting and is encouraged to eat cold foods such as gelatin and ice cream after nausea subsides.

WARNING

Do *not* give hot or spiced foods, carbonated beverages, or those with high acidity such as orange juice. They can result in pain or bleeding. Some doctors also discourage sucking from straws.

g. Contagious Diseases of Childhood. Among the contagious diseases of childhood are the common cold; chicken pox; measles (Rubeola); meningococcal meningitis; mumps; pertussis (whooping cough); poliomyelitis; German measles (Rubella); scarlet fever; and pneumonia. These contagious diseases are all coverd in table 5–6; unit care of contaminated equipment is covered in table 5–7.

h. Burns. Burns consist of tissue destroyed due to exposure to heat, chemicals, or electricity; ultraviolet and roentgen rays; or contact with radioactive surfaces. Over 55 percent of burns occur in children. Burns are classified (para 8–34) according to the depth of tissue destroyed. The doctor will decide the degree and the treatment, but the specialist must watch a burned hospitalized child for shock and toxicity (high fever, rapid pulse, prostration, cyanosis, decreased urine volume, and vomiting). The child must be protected from infection. An accurate intake and output record must be maintained, a footboard used to prevent contractures, proper alinement maintained, the bed kept dry, and the child turned every 2 to 3 hours. Care must be taken to prevent contaminating the burned area with feces. Frequent checking of the child is necessary. Burns usually result in prolonged hospitalization, and recreation must be planned for the child. It is as much a part of the treatment as many nursing procedures.

i. Nephrosis. Nephrosis is a kidney disease. The gross edema which is symptomatological of the disease requires special consideration of the skin. Edema first starts at the eyes or ankles but spreads until it becomes generalized. It shifts as the child changes position while sleeping. The abdomen can become so distended that stretch marks similar to those of a pregnancy may appear. (Vomiting and diarrhea may also occur.) The child is irritable, listless, and pale. Good skin care is especially important during the severe edema. At least one bath daily is required and more may be necessary. Special attention must be given to neck, underarms, groin, and other moist areas. Soothing powder is used on male genitals. The scrotum may need support; if so, a soft pad is held in place by a T binder—adhesive tape is NEVER used. The child is turned frequently, his head may be elevated from time to time to reduce eyelid edema, and a pillow between the knees may help prevent pressure on sore surfaces. Accurate intake and output records must be kept. For a baby in diapers, an accurate record of the urinary output may be kept by accurately weighing the diapers before and after the child urinates. The character, odor, and color of the urine must also be noted.

j. Pediculosis. Pediculosis is lice infestation. The nits (eggs) of the head louse appear as small, white or grayish flecks which are attached firmly to the hair shafts. Each nit will hatch in a maximum of 4 days. Treatment consists of cutting long hair and administering specially medicated shampoos and baths, as prescribed, to kill the organism. The prescribed medication is also administered. Nits may be removed by combing the hair with a fine-tooth comb dipped in hot diluted acetic acid (vinegar). Bed clothing, hats, caps, and clothing must be cleaned and disinfected.

k. Ringworm (Tinea). Ringworm occurs on the smooth skin, hands and feet, or scalp. The *tinea circinata* (smooth-skin ringworm) initially appears on the face, neck, or forearms. Usually only one appears at first—it is small, pinkish, round, and covered with small scales. Other lesions spread from this. There is very little itching. Another smooth-skin type, *tinea cruris*, first appears on the buttocks, thighs, or anal fold. It is accompanied by a greater degree of itching. Both respond to half-strength Whitfield's ointment applied daily. *Tinea capitis*, or *tinea tonsurans* is ringworm of the scalp. One type, *Microsporum lanosum*, comes from an animal source and cannot be transmitted to another child. *Microsporum audouini* is the other type, which is readily transmitted to other children. The lesions are round red patches with scales on the scalp of the head. Usually, no hair is present in the area. Topical treatment may be used for both, but X-ray therapy may be necessary with the latter. *Tinea of the feet* (or athlete's foot) is helped by fungicides of the doctor's choice, frequent sock changes, and airing of shoes.

l. Dermatitis Venenata. This is a contact dermatitis caused by direct contact with a vegetable irritant, usually poison oak or poison ivy. It is accompanied by a skin eruption, swelling, burning, and intense itching. If the attack is severe with considerable swelling, the doctor may order continuous hot compresses of liquid aluminum acetate.

m. Scabies (Itch). Scabies causes severe itching, particularly at night. Secondary infection from scratching is a danger. Treatment consists of destroying the parasite, the itch mite. In treatment with sulfur ointment, the child must be thoroughly scrubbed and soaped in a hot bath before the ointment is applied. The ointment is applied all over the body except for the head, to include neck and soles of feet. Then no baths are given for 3 days although the ointment is still applied for 3 nights. On the fourth day, the patient is again given a thorough hot bath and all contaminated clothing and bed linens are boiled or dry cleaned.

n. Furunculosis. This condition goes with boils. A furuncle is usually a staphylococcic infection of a sebaceous gland or hair follicle. It is a red, elevated, sore area that eventually comes to a head. If it does not rupture, it must be incised, but it should never be squeezed with the fingers. Hot compresses will hasten the rupture. These patients must be kept away from other patients to prevent the spread of staphylococcal infection.

o. Herpes Simplex and Herpes Zoster. These are virus diseases. Herpes simplex causes unsightly sores around the lips, eyes, and even on the genitals. The virus tends to recur. Herpes zoster symptoms begins with an area of skin that is tender or sore. This area will later erupt into papular lesions which soon become vesicules. The disease is extremely painful. The most common site is along a rib, starting at the spine, although it can occur around the eye.

p. Leukemia (Cancer of the Blood). The cause of leukemia is not known, but the disease is characterized by an uncontrollable increase in production of a specific kind of white blood corpuscle and a decrease of other types of white blood corpuscles, red blood corpuscles, and platelets. The abnormal blood picture is usually the first symptom. At the present time, treatment gives only a temporary benefit; the primary treatment is to keep the patient comfortable and relatively happy. If Aminopterin or A-methopterin is given, the specialist must watch for symptoms of nausea, vomiting, diarrhea, ulceration of the mucous membranes of the oral cavity, alopecia (loss of hair), and high fever. These are signs that the toxic level of these drugs has been reached. If a child is on cortisone therapy, the specialist should see that the child is put to bed 1 hour before each meal; otherwise, he will be too tired to eat (cortisone makes the child feel better, so his activity increases, but it does not dissipate his tendency toward fatigue). When the platelet count goes under 100,000, the specialist must be alert for bleeding. Cotton swabs must now be used instead of toothbrushes. Bleeding can occur at the gums, nose, or rectum and can be so severe that transfuions will be needed. Petroleum jelly must be applied to the lips, which become dry and cracked. Since the child has so little resistance to infection, he must be protected from infection or chilling. Skin care and care of the mucous membrane surfaces of the mouth must be gentle. The doctor will order comfort measures, but he will need the specialist's observations. Because of the pain, some children will prefer to be in bed or in a wheelchair rather than to be held. The child will also resist being bathed because of the pain. The specialist must encourage the child to eat something, so the diet is never forced on the child. He is usually allowed to eat anything he wants.

q. Diabetes. Diabetes is a condition in which the body cannot oxidize carbohydrates properly because of a lack of insulin. Although the cause and cure of this disease are not known, heredity may be a predisposing factor. The disease can be controlled by diet, insulin, and exercise. Common symptoms include polydipsia (extreme thirst), polyphagia (constant hunger), and polyuria (excessive urine, which may cause bed wetting and "accidents" in the day). The overweight that is characteristic in adult patients with diabetes seldom appears in children. Complications include *diabetic acidosis* (also called diabetic coma), where the face flushes, the lips become red, the breath has a characteristic sweet odor, the respirations increase and become labored, and dehydration occurs; *hypoglycemia* (insulin shock) which is caused by too much insulin and is characterized by irritability (temper tantrums in young children), hunger, weakness, double vision, and tremors; and *pyogenic infections,* which are more dangerous to a diabetic child than to the normal child. The specialist will routinely check the urine before each meal and at bedtime for presence of sugar and record the result, and insure that the correct diet is served on time. He then checks the

types and amounts of food tha the child did not eat, records this, and also informs the nurse in charge (she informs the dietitian who can then determine whether the child will need a snack between meals). Diabetes is much more difficult to control in children than in adults because of the need to compensate for irregular eating habits, expenditure of energy in spurts, and more frequent infections. The doctor prescribes the amount of insulin and the time that it is to be given. It is usually administered *subcutaneously*. The dosage is measured in units, and special syringes for administration of insulin only are used. This medication is usually given by the nurse, but if the clinical specialist does it, he must administer insulin in the exact dosage ordered and at the prescribed time.

r. Epilepsy. Epileptic seizures are usually recurring periods of unconsciousness that are often accompanied by paroxysmal (sudden), tonic (continuous muscular contraction) or clonic (a series of spasms) muscle spasms. The seizures may be mild and brief (petit mal) with little muscular spasm, if any; or they may be generalized, with both tonic and clonic spasms (grand mal). The onset of grand mal is sudden. As it begins, the patient may utter a quick cry and then fall. The face may be pale, the pupils dilated, the extremities stiff or contracted; the jaw muscles may also contract swiftly (this may cause the tongue, lips, or cheeks to be bitten); and incontinence may occur. During a seizure, maintenance of an airway and prevention of injury are the first concerns. (Once a seizure begins, the specialist can do nothing to stop it, but he can prevent injury to the child.) A padded gag or a firm roll of gauze should be inserted well back in the mouth between the teeth. The gag should not be forced between clenched teeth because of the danger of trauma to the gums and teeth. After a seizure has started it may be too late to prevent the child from biting his tongue by inserting a wedge. If on the floor, the head should be protected or cradled. The specialist should record exactly what happens—the time; how it began and in what part of the body· incontinence; position and movement of eyes; and duration, severity, and reaction of the child after the attack. Afterward, the child should be made clean, dry, and comfortable and allowed to sleep. When he wakes up, he may be confused and have a severe headache. He should be carefully observed. The specialist must be careful to avoid showing overprotection, pity, or disgust. If anticonvulsant drugs are ordered, the specialist must be sure that they are administered at the correct time and are actually swallowed. Treatment also includes provision of a calm atmosphere and dietary management.

s. Cerebral Palsy. This is a group of disorders that affect the motor centers of the brain. Although not progressive, there is no presently known cure. Cerebral palsy is caused by birth injuries, anoxia, subdural hemorrhage, or infections such as meningitis. Symptoms range from mild to severe but usually include feeding problems, convulsions but no high fever, and physical retardation (child is not able to sit, crawl, or walk at the normal range for his age level). Mental retardation may also, but not always, be present. Types of cerebral palsy include spasticity (tension in certain muscle groups, particularly those of lower extremities) and athetosis (involuntary, purposeless movements which interfere with normal motion). Speech, sight, hearing, and emotions may be affected. The disability should be explained to the parents, who must learn to accept the child as he is. Good skin care is essential and exercise is necessary to prevent contractions (a shortening of muscles due to lack of use). The specialist must insist that the patient do as much as he can for himself. The specialist must also carry out the physical therapist's assignments and instructions for the child. If braces are used, the specialist checks them from time to time for such things as alinement and wear. A long hospitalization will probably be required. The specialist must avoid focusing his attention on the child's abnormalities and remember that he is an individual—and *accept him as he is.* He should be *empathetic,* not sympathetic. Above all, he must encourage the child during this stage of psychological as well as physical growth to be self-reliant and independent. The specialist may also encounter feeding problems. Often the child must be fed slowly to prevent aspiration. It is hard for such infants to adjust to solid foods, so the specialist must have extreme patience. Since the child tires easily, he should have frequent naps in a quiet room. The child may appear to be emotionally unstable, but this may be caused by frustration because even simple tasks can be overwhelming to him—his continuous failures cause him to despair of ever succeeding. Guidance and patience are absolute necessities to keep the child happy within his capabilities.

t. Rheumatic Fever. Rheumatic fever occurs primarily between 5 and 15 years of age. It frequently follows infections caused by group A

beta-hemolytic streptococci. Recurrences are frequent and many deaths because of cardiac involvement are directly traceable to it. Its symptoms are general—malaise, loss of weight and appetite, paleness, low-grade fever (especially in the afternoon), and spontaneous nosebleed. A single attack will last from 1 to 3 months or longer. Successful nursing care depends upon absolute bedrest and lack of excitement. Sometimes a child may not feel ill; then the specialist will have difficulty keeping him in bed. Some children will have emotional difficulty—withdrawal, refusal to admit that they ae ill, or complete rebellion. Mood changes can be extreme, so the specialist must be prepared to be accepting and cheerful no matter what reception he meets. The specialist will probably be required to take the child's TPR every 4 hours and to observe him for lesions, dyspnea, swollen joints, and complaint of pain. Sometimes the child will have diaphoresis (severe sweating); then his skin will have to be bathed, and gowns and bed linen changed frequently. An emollient or oil may be prescribed for dry skin surfaces.

u. The Battered Child Syndrome.

(1) *General.* The abused child has always been a problem. Although statistics show that this syndrome is increasing in recent years, it may well be that it is only recognized and publicized more. Infants and small children are the usual victims. Suspicion of child abuse is aroused when any one or more of these factors are present—

- There are multiple bruises and lacerations.
- The injuries seem out of proportion to the story told about the accident.
- The parents attempt to conceal information.
- There are obvious signs of neglect and malnutrition.
- The child fails to cry. (The unknowledgeable may think that they are merely being exceptionally good children.)

These battered children arouse strong feelings of indignation, even hostility, but nursing personnel must be careful to remain objective. It is often difficult to prove that the injury was intentionally afflicted; in some cases, it may indeed have been accidental. Even if it seems apparent that the child has been injured by one of his parents, the specialist should report his observations to the nurse or physician, and avoid expressing his indignation to patients or parents.

(2) *Parents of battered children.* Such a parent may be like a hurt child, too, and may be incapable of seeing that the infant or child is an immature person. He often looks to a mere infant to satisfy his emotional needs and becomes infuriated when the baby cannot help him. It is a blunder to antagonize the parent because it makes future communication difficult. The majority of parents who injure their children want help. In most cases, they have voluntarily brought the child to the hospital. If help is offered without accusations or threats, the parents may cooperate. The goal is to help the parent and to do what is best for the child. Nursing personnel must remember that some of these parents are mentally ill or mentally retarded; others are emotionally immature persons who were neglected or abused as children; others may be overwhelmed with problems; all have strong guilt feelings.

(3) *The specialist.* The specialist can best help by observing the parents. What is their reaction to the child? You can suspect abuse and alert the nurse or doctor when parents are critical of the child, angry because he is hurt, seldom touch or look at him, show no remorse nor concern about his treatment, leave the hospital soon after he is admitted, and seldom visit him. These parents usually will not volunteer information and are irritable or evasive when describing the circumstance attending the injury. They will usually maintain that the child injured himself. On the other hand, they may offer much information about the injury; however, much may be false and misleading. Any information obtained from the parents or observation of their reaction to the child should be immediately reported to the nurse or doctor. This information must be considered confidential and not gossiped about with other ward personnel.

(4) *The child.* The chid will not cling to his parents for reassurance or comfort. Such children seem afraid of physical contact initiated by the parents or by anyone. They may whimper or try to withdraw from any contact. They seldom cry, seemingly realizing that crying has only brought them more pain. If they cry during treatment, their crying is hopeless, without any expectation of being comforted. Small infants may lie motionless with no expression on their faces. Children who can talk may or may not tell you that their injury was inflicted by the parent.

(5) *Nursing care.* As the child begins to show some awareness of the change in his situation, you should offer some bodily contact. When he responds, you must respond, also. The child will become more active as he improves and may test his relationship with you by such actions as tentative biting or poking with his fingers. He may be

extremely anxious and cling to anyone, or he may withdraw completely. Tender, loving care is the key in the approach to the battered child, more so to this child than to any other pediatric patient.

(6) *The Army health nurse.* The Army health nurse is usually brought into the case as soon as there is suspicion of child abuse. He needs to establish a relationship with the child and its parents that he can sustain in the home environment. The child may, however, not be returned to his home. He may be removed temporarily or permanently. His safety is the paramount governing factor. Even then the Army health nurse can be of service in his new environment.

10–29. Congenital Anomalies

a. General. Some congenital anomalies cause death or permanent handicaps; others can be corrected surgically. Any part of the body may be affected. There can be a complete absence of a part or a malformation.

b. Malformation of Mouth and Palate. The more frequent of these malformations are cleft palate and harelip, the result of failure of the maxillary, premaxillary, and palatal processes to fuse. One may occur without the other, but they frequently occur together. Although these babies have excellent appetites, they have trouble in sucking and swallowing. They swallow large amounts of air, and need to be burped often. Surgery is the only treatment. A harelip can be operated on around the age of 3 months, but a cleft palate is not usually repaired until after the child reaches 2 years of age. Meanwhile the baby must be fed, and the parents must be taught how to feed him. No one method will work for all—some infants can be fed, using a special nipple (fig. 10–7); others must be fed by cup or by medicine dropper with a rubber tip to prevent injury to their gums; and some require gavage. For infants with harelip repairs, medicine droppers with rubber tips or asepto syringes with rubber tips are used. For infants with cleft palate repairs, a cup or asepto syringe with rubber tip is used.

c. Malformation of Trachea and Esophagus. The most common malformation is atresia (absence or closure of a normal body orifice) of the esophagus with tracheo-esophageal fistula. In the most common type of this particular malformation, the upper portion of the esophagus terminates in a blind pouch in the upper chest, the lower portion is a closed tube extending above the diaphragm, and the tracheo-esophageal fistula is

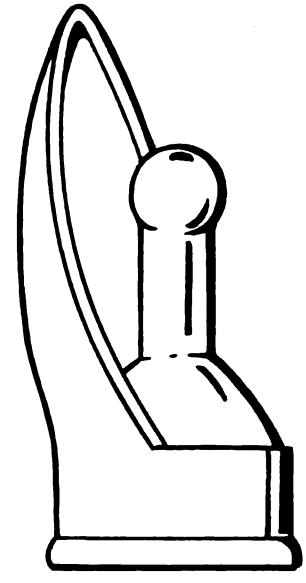


Figure 10–7. Cleft palate nipple.

connected with the lower section of the esophagus. An infant with this malformation will have saliva flowing from his mouth because he can swallow only a small amount before the pouch fills. If the upper portion of the esophagus fills and there is overflow in the trachea, the infant may get pneumonia. Early surgical correction is necessary since the infant cannot take his formula because of instant regurgitation, choking, coughing, and cyanosis. This operation requires entry into the chest wall, so the infant will require water seal drainage (para 5–113), with the number of bottles determined by the physician. The specialist must change the child's position frequently, and coughing and crying are desirable. (The baby can be made to cry if the sole of his foot is tapped gently.)

d. Malformation of the Epiglottis. Among these malformations are those of the epiglottis and structures around it, collapsing larynx and trachea, and deformities of laryngeal cartilages or vocal cords. These are characterized by laryngeal stridor. Such infants need slow and careful feeding by small nipple or medicine glass and sometimes by gavage. There is constant danger of aspiration and of respiratory infections. Cysts and tumors of the throat are also common. Generally, such surgical patients need about the same nursing care as adults with laryngeal difficulties.

e. Hydrocephalus. This is a congenital anomaly where there is an increase of cerebrospinal fluid in the ventricles of the brain which results in an increase in head size and pressure changes in the brain. The main symptom is the enlarging head

size, but the scalp may also be shiny, the veins dilated, and the eyes crossed. The infant is irritable, vomits, has anorexia, and may have convulsions. The position of the patient without surgery must be changed frequently to prevent pressure sores and hypostatic pneumonia; the infant or child cannot turn himself because of the increasing size of the head. When the infant is turned, the specialist must support the head in the palm of one hand while rotating the head and neck together to prevent a strain on the neck. The specialist must also support the baby's head when lifting or feeding him. A calm quiet atmosphere is necessary during feeding. Afterward the baby is put on his side and left undisturbed for a time. This child needs tender loving care like all other children. The specialist must not neglect him.

f. Malformation of the Pylorus. The symptoms of pyloric spasm and pyloric stenosis (para 10–27) include projectile vomiting without any sign of nausea and with visible peristaltic waves traveling from left to right, and loss of weight, obvious abdominal bulges, and few stools. A child with this malformation is usually tense and needs a quiet, relaxed environment. The specialist must attempt to meet his needs for adequate warmth and for cuddling, particularly before and after meals. The child must not be excited or handled vigorously.

g. Intestinal Obstructions and Imperforate Anus.

(1) The most common anomalies of the bowels are intestinal obstructions—atresia (a complete block), stenosis (a partial block), volvulus (incomplete anchoring), and meconium ileus (meconium is so thick that it cannot pass through the intestinal tract). Most of these require surgical treatment. Even then, there is always danger of chronic nutritional disturbances and pulmonary disease.

(2) An imperforate (no normal opening) anus is normally discovered when the baby is examined at birth, and surgery is done immediately. It is often accompanied by fistulas of the perineum, urethra, bladder, or vagina.

(3) Infants with intestinal obstruction are in poor condition and suffer from dehydration before surgery. High fever must be reduced to at least 102° F. (R). After surgery, the specialist takes and records the respiration and pulse rates every 15 minutes until reaction. If the child becomes cyanotic, the doctor is called, and these procedures are performed every 5 minutes. Afterward, rectal temperatures (except for operations on rectum or anus*) are taken every 2 hours if fever is over 102° F.; otherwise, it is taken every 4 hours. If a vein on an arm or leg has been cut-down for continuous intravenous therapy, the arm or leg is put on a well-padded splint and wrapped securely. The child may need to be restrained by clove hitches and is usually turned every 2 hours. Intake and output are totaled every 8 hours and every 24 hours and recorded.

h. Spina Bifida. This is a congenital malformation that results in imperfect closure of the spinal canal, usually in the lumbosacral region. Because portions of the bony spine are missing, the membranes may protrude through the opening (called a *meningocele*). If the membranes and cord protrude, it is called a *meningomyelocele,* which is often accompanied by leg paralysis and some loss of control of the functions of the bowels and bladder. Surgery may be used for either but, in a meningomyelocele, rehabilitation is needed to teach the child to use a wheelchair and to walk on crutches, when possible. This rehabilitation period also requires extensive nursing care to prevent infections and provide for correct positioning, careful skin care, and accurate observations and charting.

i. Congenital Cardiac Disease. Only a few of the numerous congenital cardiac conditions are listed here. If further information is needed, an up-to-date pediatric text should be consulted. In general, children adapt themselves readily to the limitations of their particular disease. Sudden death rarely occurs in these types of cardiac conditions; the main thing that must be guarded against is infection. The heart defects that are congenital are generally divided into cyanotic and noncyanotic.

(1) *Cyanotic.* Children with cyanosis generally have a shunt that lets the venous blood travel by abnormal channels from right to left. Circulation through the lungs, which oxygenates the blood and gives it its red color, is bypassed. The types include—

(*a*) Tetralogy of Fallot (fig. 10–8Ⓓ), whose symptoms are deep cyanosis, polycythemia (too many red corpuscles in the blood), and circulatory failure. A child with this defect is often below normal physically and is overdependent, insecure, and immature. The specialist must accept the child as he is.

(*b*) Transposition and displacement of the

* Axillary temperatures are taken on patients having rectal or anus abnormalities.

great vessels. These may be accompanied by pulmonic stenosis. In the Taussig-Bing syndrome, the aorta leads from the right ventricle and overrides the pulmonary artery. In Ebstein's malformation of the tricuspid valve, the abnormal valve is displaced into the right ventricle.

(2) *Noncyanotic.*

(*a*) Ductus arteriosus. This is a normal condition during fetal life. There is a connection between the aorta and pulmonary artery which permits the blood to flow directly to the aorta, thus bypassing the lungs. If the connection fails to close shortly after birth, it may give rise to symptoms of cardiac failure, depending upon its size. It is known as a patent (open) ductus arteriosus.

(*b*) Coarctation of the aorta. The same mechanism that normally affects the ductus arteriosus may extend to the aorta and narrow its lumen (fig. 10–8Ⓑ). (Compare with figure 10–8Ⓐ which illustrates a normal heart.)

(*c*) Atrial septal defect (fig. 10–8Ⓒ).

- *Atrial secundum defect.* This is a hole in the atrial septum, permitting communication between the two atria and the shunting of blood from left to right.
- *Ostium primum.* This defect is lower in the septum. Involving the areas of the mitral and tricuspid valves, it is more complicated because, in addition to the shunting of the blood, the clefts in the mitral valve permit blood to regurgitate from the left ventricle into both atria. Both types increase the workload of the heart.

(*d*) Ventricular septal defect. This is a hole in the ventricular septum permitting communication between the two ventricles. In this, the flow of blood is also from the left to the right, because the blood pressure is higher in the left ventricle than the right. Blood sent to the left ventricle from the left atrium and lungs makes a circuit again through the right heart and the lungs.

(*e*) Pulmonary stenosis. Sometimes the pulmonary valves unite together, which narrows the passages from the right ventricle to the pulmonary artery (fig. 10–8Ⓓ). At other times, the entire ring of tissue around the valve may be narrowed. Muscle bundles within the right ventricle itself may also obstruct the flow of blood to the pulmonary artery.

j. Undescended Testes (Cryptorchidism). Before birth, the testes of the male descend into the scrotum. If this does not happen and the testes remain in the abdomen, inguinal canal, or other structures, they are called undescended testes. Treatment is important to preserve fertility. When there is no hernia, endocrine therapy is usually tried. If unsuccessful, surgery is used. The specialist will notice that upon the child's return from surgery a rubber band is attached to the suture and anchored to the midthigh with adhesive tape. This is necessary to apply tension to the testicle to hold it in place, and it must be protected from any disturbance until its removal. The child will attempt to walk in a stooped position in order to relieve the discomfort. Encourage him to walk upright and remind him when he forgets. An indwelling catheter may or may not be used to prevent contamination of the suture line.

k. Other Malformations.

(1) Genitourinary tract. There can be defective or displaced kidneys or exstrophy of the bladder.

(2) Genital organs. In females, the most common are imperforated hymen, incomplete epispadias, or adhesions of the clitoris or labia. In males, there can be malformation or abnormal location of urethral openings, phimosis, and hydrocele. An individual may also be afflicted with hermaphrodism—in which both ovaries and testicles are present—but this is rare. It is more common to see an individual possess the signs of one sex and have the gonads of the other.

(3) Liver, gallbladder, and bile ducts. There can be tumors of the liver, two gallbladders or none at all, and atresia of the bile ducts.

(4) Skeletal system.

- Clubfoot is common. The foot may be twisted inward or outward (fig. 10–9). Two types of casts used are shown in figures 10–10 and 10–11.
- Polydactylism is an excess of fingers or toes.
- Syndactylism is a fusion of two or more fingers or toes.
- Congenital amputations are those where all or a part of an extremity is missing.
- Congenital dislocation of the hip is due to a malformation of the acetabulum which allows the femur's head to be displaced. If treatment begins before the child is a year old, a Putti splint (fig. 10–11) is usually used.

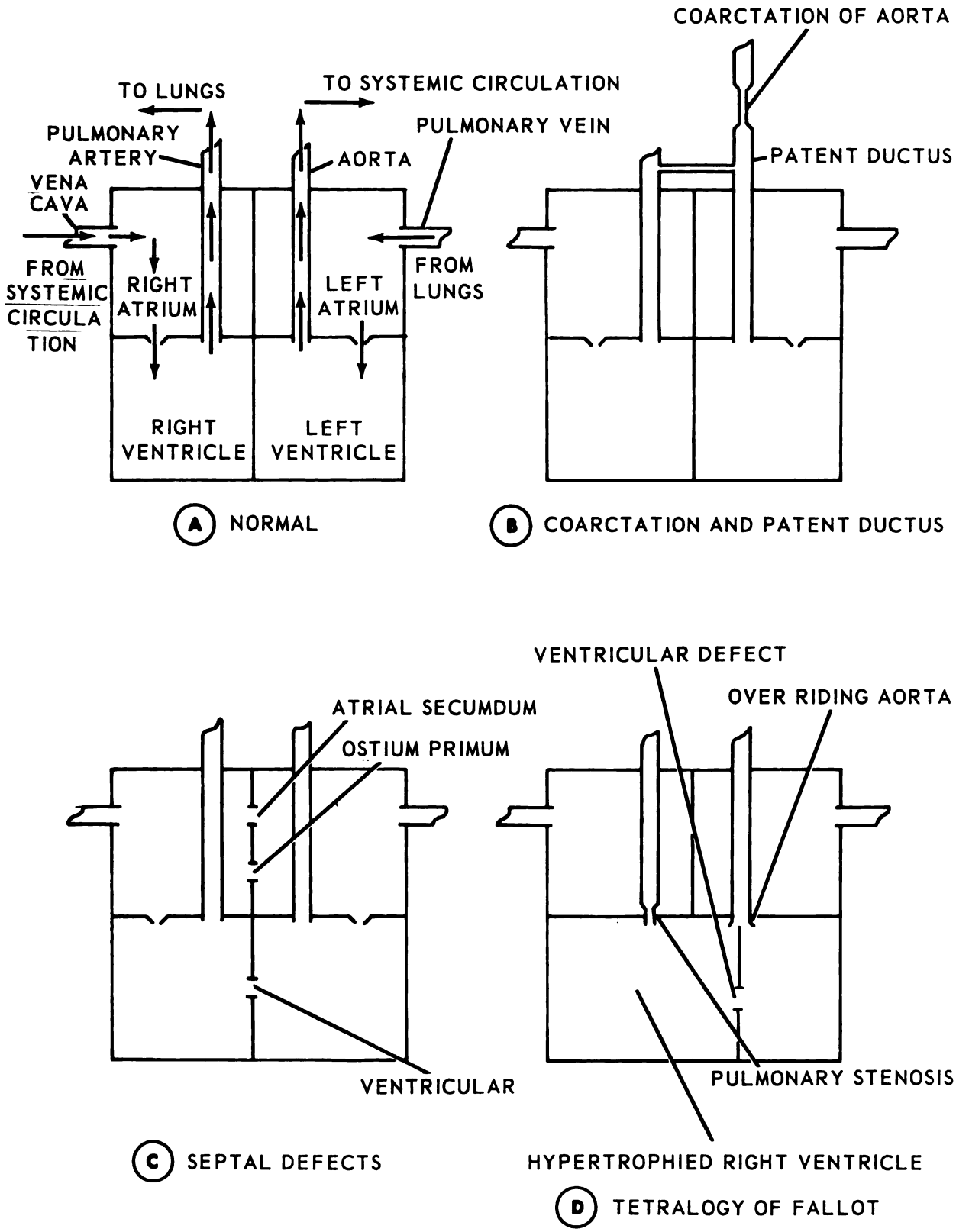
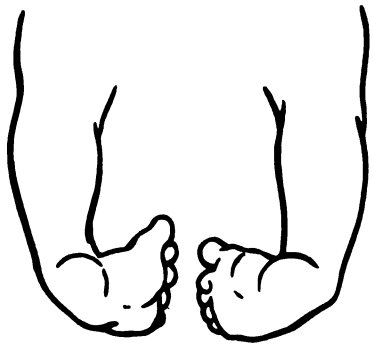
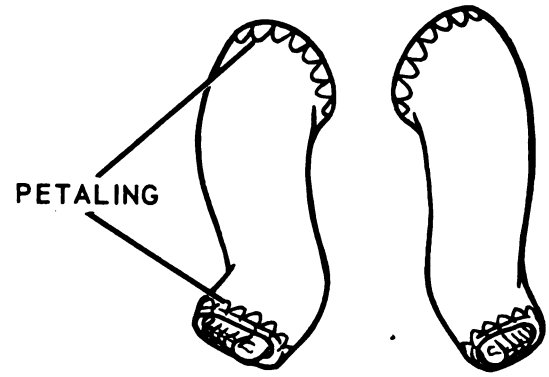


Figure 10-8. Congenital anomalies of the heart (schematic diagram).



CLUB FEET
(BILATERAL
TALIPES
EQUINOVARUS)



CHECK TOES FOR WARMTH AND PINKNESS
AFTER CAST IS APPLIED

Figure 10–9. Clubfoot (inward) and one type of casting.

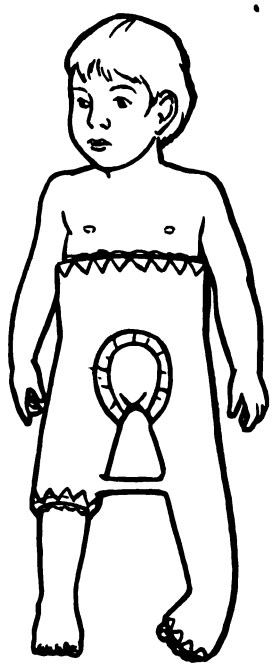


Figure 10–10. One type of unilateral clubfoot cast.

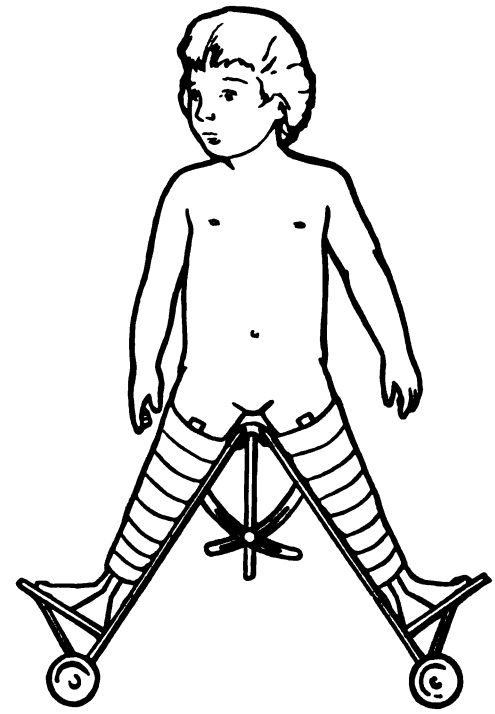


Figure 10–11. The Putti splint.

★Section VII. SPECIALIZED NURSING PROCEDURES

10–30. Fluid Therapy

The normal fluid requirements of a newborn baby are few; he has a higher ratio of water to his body weight than at any other time. However, vomiting or diarrhea will cause dehydration and loss of weight. Symptoms of excessive fluid loss are—

- Sunken eyes and fontanels (unossified spot on the head).
- Poor skin turgor (distention and resiliency).
- Dry mouth.
- Concentrated urine.
- Loss of weight.

a. Oral Fluids. The best and the most natural

method is to give fluid by mouth. Since infants and small children need help to drink, the specialist must remember to offer drinks often but only in small amounts. Sometimes a bright-colored container will help with a child. The specialist must also keep an accurate record of the child's intake and output. This is extremely important on a pediatric ward.

b. Intravenous Fluids. Since infants do not have large veins at the antecubital fossa, two methods are used to give IV fluids to infants up to 6 months of age: scalp-vein infusion (simplest) and surgical cutdown. Both of these procedures are done by the physician. The specialist may assist.

SCALP VEIN INFUSION

EQUIPMENT

Syringe, 2 ml., filled with saline
Short bevel needle
Elastic tubing
Antiseptic sponge
Infusion set with 100 ml. bag and microdrip chamber
Fluid (ordered by doctor)
Rubber band tourniquet
Dry 2- by 2-inch sponge

PROCEDURE

1. Attach bevel needle to plastic tubing (fig. 10–12).
2. Turn infant crosswise and shave head over temporal area.
3. Apply a rubber band about the head just above the ear.
4. Restrain the infant with head held to one side, using the mummy restraint. (The doctor will disinfect the site, insert the needle, and tape it in place.)
5. Cut the rubber band.
6. Express air bubbles from IV tubing and connect to a plastic adapter.
7. Permit a small amount of fluid to run in rapidly to check for swelling at the site.
8. Apply final dressing.
9. Do not permit the infant to lie on the side with the needle. Depending upon the site of the needle insertion, the infant's head may have to be taped in an immobile position or simply positioned with sandbags. This will prevent him from dislodging the needle.

SURGICAL CUTDOWN

This procedure requires sterile technique.

EQUIPMENT

Commercially prepared cutdown tray or tray prepared by CMS
Splint
Tape
IV stand, tubing with 100 ml. chamber and microdrip, solution as ordered by physician
Sterile gloves

PROCEDURE

1. Open cutdown tray using sterile technique.
2. Be available to help restrain infant and supply material that may be required by physician. (The baby does not remain restrained unless the doctor so orders. If he does, put the baby on his side and change his position frequently.)

CAUTIONS

1. Start the fluid slowly.
2. Calculate the number of milliliters per hour and the drops per minute (para 5–61). Adjust the flow.
3. Observe the infant for edematous tissues or evidence of infiltration.
4. If the fluid stops running, check the flexion of the limb (straighten it), the tightness of the bandages (loosen them), and the tubing (milk it to try to reopen it).

10–31. Suctioning and Tracheotomy Care

In addition to the information contained in paragraphs 5–69, 5–107*d*, and 5–110, specialists should remember the following points:

PROCEDURE FOR ESTABLISHING RESPIRATION IN NEWBORN

(Any step may be omitted as necessity dictates. Deep aspiration, when required, is done by the nurse.)

1. Try to remove obvious secretions that might hinder breathing by wiping the infant's nose and mouth.
2. Place the infant in the Trendelenburg position to promote drainage and gently stroke the neck up toward the mouth (fig. 10–13).
3. Use a bulb syringe.
4. If the steps above do not work, use a small catheter with a De Lee mucus trap. Hyperflex the infant's neck slightly and place the catheter in his nose or mouth. Insert the mouthpiece (fig. 10–14) in your mouth and

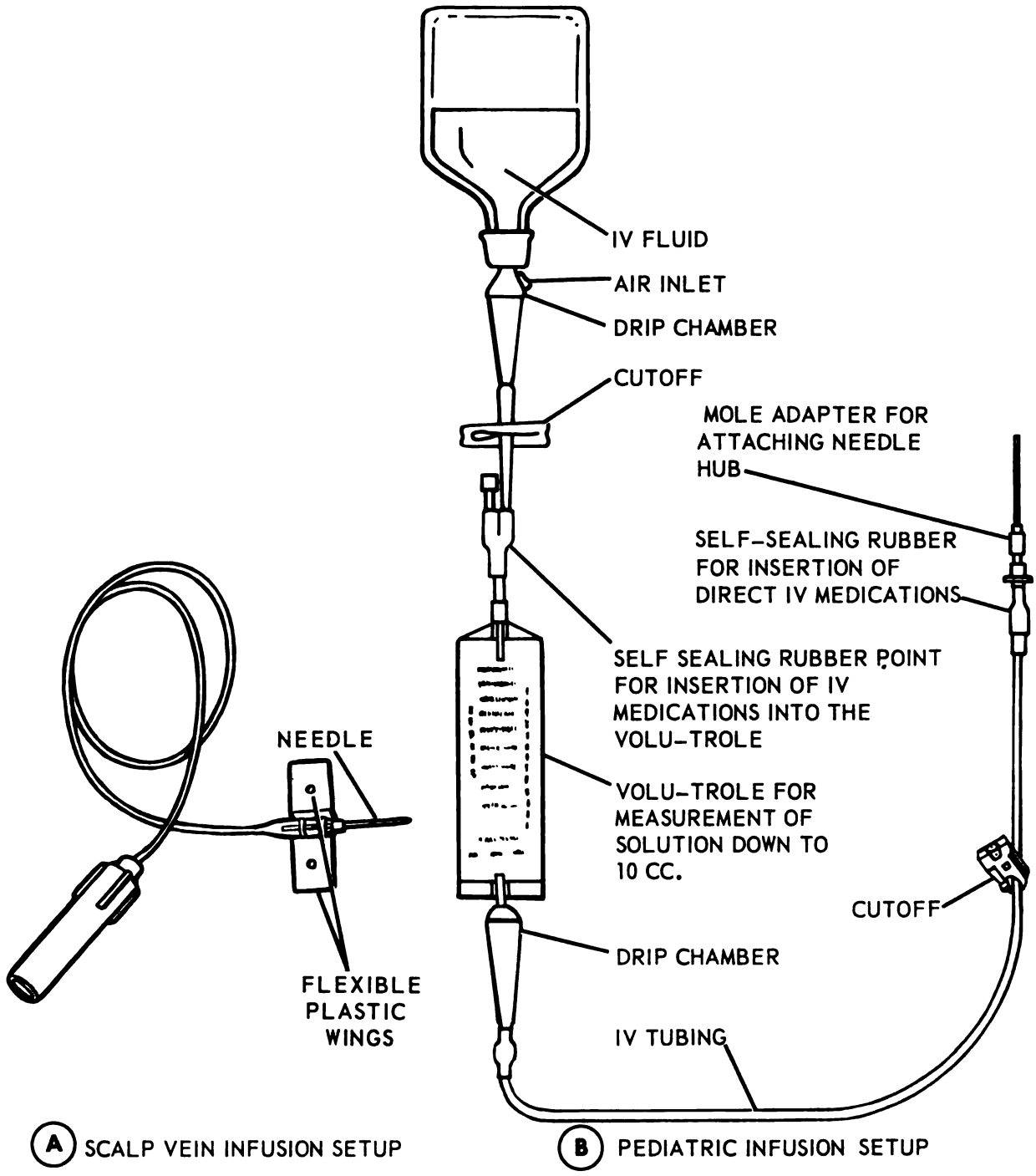

IV FLUID
AIR INLET
DRIP CHAMBER
CUTOFF
MOLE ADAPTER FOR ATTACHING NEEDLE HUB
SELF–SEALING RUBBER FOR INSERTION OF DIRECT IV MEDICATIONS
SELF SEALING RUBBER POINT FOR INSERTION OF IV MEDICATIONS INTO THE VOLU–TROLE
VOLU–TROLE FOR MEASUREMENT OF SOLUTION DOWN TO 10 CC.
CUTOFF
DRIP CHAMBER
IV TUBING
NEEDLE
FLEXIBLE PLASTIC WINGS
A SCALP VEIN INFUSION SETUP
B PEDIATRIC INFUSION SETUP

Figure 10–12. Scalp vein infusion setup.

suck. The mild suction will draw mucus into the trap.

5. Use special precautions for oropharyngeal suctioning:
   a. Be sure catheters are sterile. Handle only with gloved hands or sterile forceps. Contamination may cause pneumonia.
   b. Extend the baby's head.
   c. Insert the catheter into his nostril for 5 to 6 cm., being careful not to apply suction during insertion as it removes much of the oxygen in the airway. Using a different catheter, repeat procedure in the mouth.
   d. Apply suction. Remember suction must be gentle. Excessive pull could damage the infant's mucous membranes.
   e. Withdraw with a twirling motion.

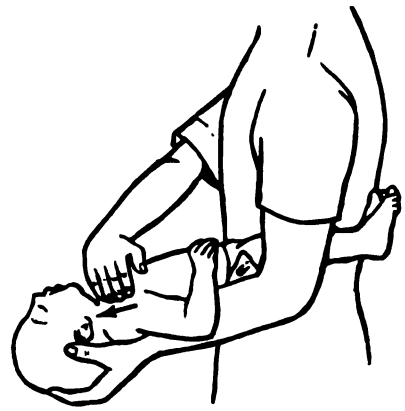


Figure 10–13. Trendelenburg position and stroking the trachea.

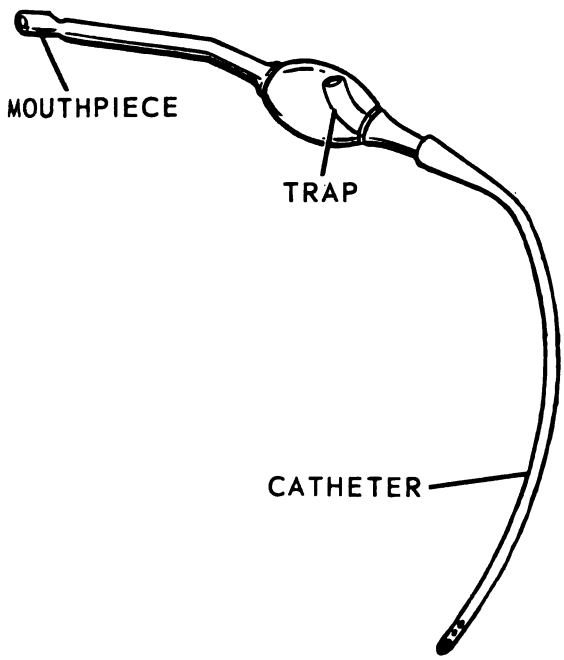


Figure 10–14. De Lee mucus trap.

WARNING

Do this all within 10 seconds as this procedure also extracts oxygen from the infant.

f. Rest and repeat as necessary, letting baby breathe oxygen between applications.

j. Use these precautions in a tracheostomy—

a. If there is time and the child can understand, explain why this tracheostomy must be done; for example, "To help you breathe better."

b. In pediatrics the doctor will select the tracheotomy tube. He bases his choice upon the size of the trachea. The specialist may be required to select a suction catheter size that will leave enough space for breathing (table 10–3).

c. Since an infant and a child have short necks, the mital lock on the tracheotomy tube can hurt the skin. Place a small towel roll or padding under his shoulders. You can also pad his chin.

WARNING

Do not use gauze bandages.

Table 10–3. Size of Catheter.

If the doctor selects a tracheotomy tube sized—	Then the catheter you use for suctioning would be—
00–1	8 Fr.
1	10 Fr.
2	12 Fr.
3	14 Fr.
4	16–18 Fr.

d. Tie the tape on the side to avoid confusion with ties of clothing.

e. Use restraints on the child or get another specialist to help you.

f. Since an infant cannot utter a sound, watch him closely.

g. Report any cough that is followed by swallowing to the doctor or nurse.

h. Be sure not to occlude the tube's lumen with a bib while feeding.

i. Maintain high humidity with atomizer, mask, nebulizer, or steam.

j. When tubes are to be removed, remember that a child may become frightened because he has become dependent on the tube. This will cause respiratory trouble —so give him tender loving care during this period.

10–32. Steam Inhalator

EQUIPMENT

Steam inhalator
Medication, if ordered
Warm water

PROCEDURE

1. Fill the inhalator with the warm distilled water and put medication, if ordered, in the machine's cup.
2. Plug inhalator in; turn switch to high.
3. Close the door and any windows.

4. Position child comfortably. He may be in a semisitting position unless contraindicated.
5. Put the inhalator's nozzle about 18 to 24 inches from the child; if it is too close, you will burn him.

WARNING

Place out of the child's reach. Children have been known to grab the inhalator and pull it over on themselves, with death resulting from the ensuing burns.

Steam should come out of the inhalator's spout until the steam surrounds the child's head.

6. Adjust switch to medium or low, depending on amount of moisture needed.
7. Time the treatment when the steam begins to flow and continue for prescribed time.
8. Refill with water as necessary.
9. Record relief obtained; how patient tolerated the treatment; time and length of treatment; and medication, if ordered.

Care of Equipment

1. Empty the water jug, wash, and dry.
2. Wash medicine cup.
3. Return machine to proper area unless treatment is to be given several times a day.

10–33. Croup Tents

a. Improvised Croup Tent.

EQUIPMENT

Cotton blanket
Sheet
Piece of screen
Safety pins
Steam inhalator

PROCEDURE

1. First put a cotton blanket, then a sheet over it, until half of the crib's top and sides are covered. (The blanket absorbs the steam and keeps it from falling on the patient.) The other half of the crib is not covered.
2. Pin blanket and sheet in place, with pins on the outside and out of the child's reach.
3. Put the inhalator next to the crib with the spout forward inside the head of the tent.
4. Put a piece of screen or some other protection between the spout and the child.
5. Refill inhalator as necessary.
6. Observe the child frequently.
7. Record the color of child, degree of restlessness, reactions, and time of treatment.

b. Croupette (Fig. 10–15). A croupette may be used for respiratory infections. It uses cool, moist air which liquefies the secretions of the bronchioles and reduces the child's temperature. Oxygen or air under pressure may be used to provide pressure.

Equipment (With Oxygen)

Croupette
Tap water
Ice
Bucket
Oxygen
Rubber sheet
Cotton blanket
Distilled water

Procedure (With Oxygen)

1. Put a rubber sheet on the crib and then cover with a blanket. (The blanket absorbs moisture and the rubber sheet prevents oxygen from escaping.)

CAUTION

Do not block the lower opening of the recirculation pipe with anything, as this will make the tent warm.

2. Fill trough at back of croupette with ice and tap water to indicated level.
3. Secure the canopy under the frame on both sides.
4. Seal canopy at the front with a folded blanket or sheet tucked loosely under the mattress sides so that carbon dioxide can escape.
5. Fill the jar into which the oxygen flows three-fourths full with distilled water.
6. Refill with ice as necessary. The ice prevents the tent from becoming too warm.
7. Change the child's clothes if they become damp, but do not open zippered portholes more than necessary.
8. Use usual precautions with oxygen (table 5–4).

Care of Equipment

1. Empty the distilled water jar, wash, and dry.
2. Drain ice and water from the trough and wash trough with warm water and soap. Do *not* use alcohol.

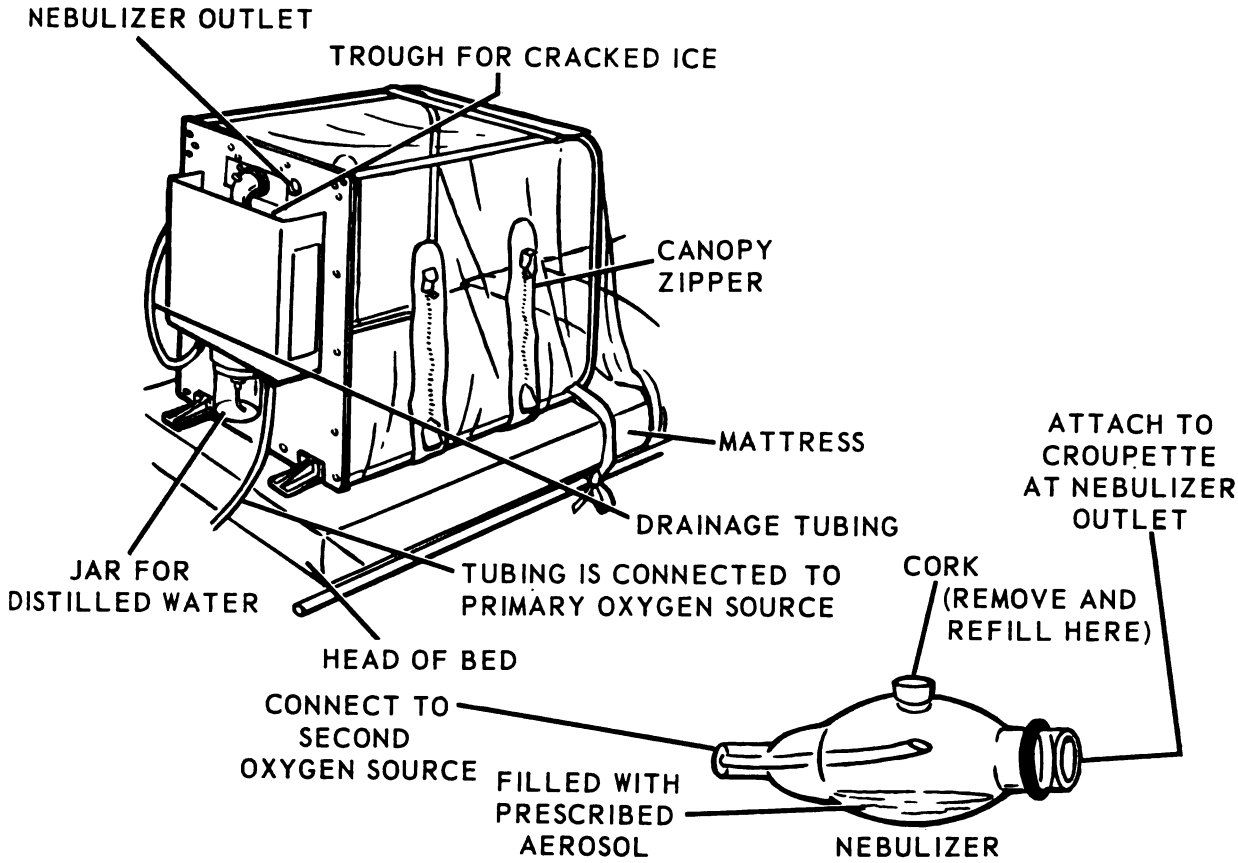


Figure 10–15. Croupette humidity tent.

3. Clean the canopy with mild soap and warm water. Fold neatly.
4. Return to the designated area.

10–34. Isolettes

If a baby must be put in an incubator, the concentration of oxygen must be checked with an oxygen analyzer with every change of shift. Oxygen should be maintained at 40 percent because of the harm that can be done to the baby with a higher concentration (blindness or retrolental fibroplasia). EXCEPTIONS: When baby has cyanosis or the doctor orders more oxygen for severe respiratory distress.

a. *Using the Isolette Infant Incubator.* Refer to figure 10–16.

1. *Lights.* The orange light is on until the desired temperature is reached. The clear light indicates the incubator is working. The red light comes on if the incubator overheats.
2. *Temperature control.* This is calibrated in numbers, *not* degrees. Higher numbers on the dial are for higher temperatures. Read the thermometer *inside* the incubator and take the infant's body temperature before changing the setting.
3. *Thermometer.* This accurately registers the temperature in the mattress area in degrees F.
4. *Oxygen inlet.* Connect the tube from the oxygen source here.
5. *Ice chamber.* Use ice in this chamber only when the incubator temperature should be lowered to *below* the room's temperature. Use cracked ice (15 to 20 pounds) and 1 quart of cold water.
   a. Turn the humidity control to open.
   b. Check the incubator's temperature frequently.
6. *Humidity control.* Turn to off, midway, or full humidity in accordance with the doctor's orders.
7. *Humidity chamber.* Keep filled with distilled water up to the black line. Invert to dispose of water.
8. *Portholes and plastic sleeves.* These are used to care for the infant (fig. 10–16Ⓑ and Ⓒ).
9. *Weighing vent.* This is used when weighing the infant. A special scale is used inside the

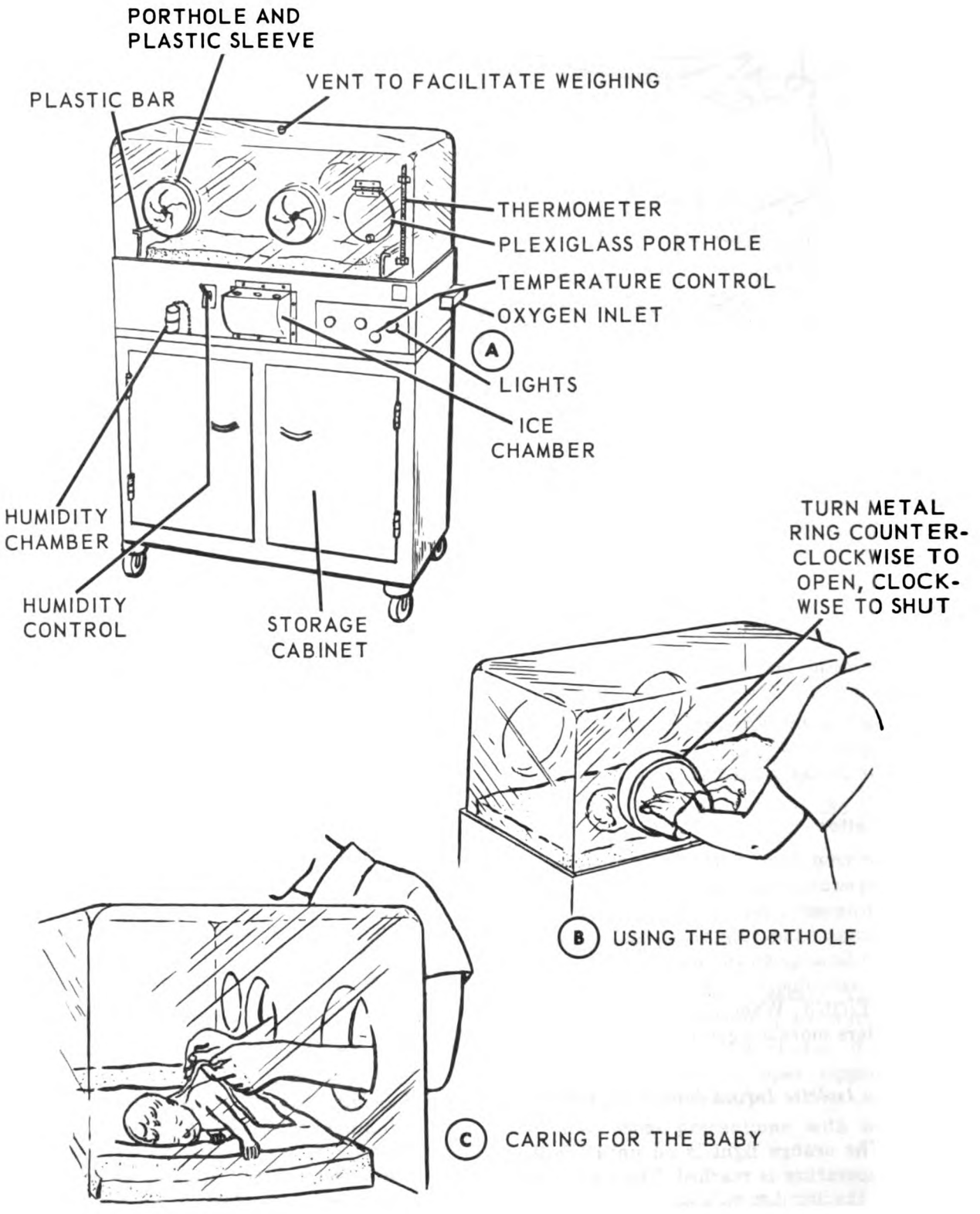


Figure 10–16. Isolette infant incubator.

incubator so the infant does not have to be removed.

10. *Plexiglass porthole.* Remove contaminated linen or other articles through here.
11. *Plastic bar.* Hook the raised end of the mattress board over the plastic bar to get a Fowler or Trendelenburg position.

WARNING

Mattress *must* be flat when the plexiglass hood is lifted to open the incubator.

12. Storage cabinet. This can be used to store the weight scale, linens, or other supplies.

Points to Remember

- Place the Isolette with an end to the wall, making it possible for two persons to have simultaneous access to the baby.
- Avoid placing the Isolette near a radiator or in direct sunlight. Either will cause the unit to overheat and start the safety alarm buzzer.
- Allow 1 hour, if possible, to preheat the Isolette to approximately 90° F.
- In addition to the precautions in table 5–4, see that the
  - —Hood is properly seated on the gasket.
  - —Portholes are closed.
  - —Six safety vent holes are open.
  - —Access door is fastened securely, with the door gasket in place.
  - —Filter screen in air intake valve is thoroughly clean at all times.
  - —Drafts directly on the Isolette from fans or open windows are avoided.
- If the Vapojette is attached to the Isolette to saturate the atmosphere higher, fill the jar with distilled water only. After every use, empty the water jar, wipe dry, remove the water filter, and clean.

Cleaning the Isolette

Wash the hood with soap and water only; polish with soft flannel cloth. NEVER use alcohol or tinctures. Isolettes must be thoroughly dismantled and cleaned between patients or as necessary for long-term patients. Isolettes should be cultured periodically since they provide an ideal environment for the growth of organisms.

b. The Oxygen Analyzer. To use, place a paper barrier on the incubator hood. Put oxygen analyzer (fig. 5–54) on top of the paper barrier. Put the long tubing through one of the open vents into the incubator. Pump the bulb about 15 times. Press the button and read the meter, which should not exceed 40 percent unless the doctor orders otherwise.

10–35. Sponge Bath

The sponge bath is generally the same procedure as for an adult (para 5–26) but the tender skin is patted rather than rubbed dry. When given to reduce a fever, it does not last over 15 to 20 minutes, and the temperature, pulse, and respiration are checked every 5 minutes. The sponge is terminated when temperature drops to 100° to 101° range and is stopped immediately if symptoms of cyanosis, chill, slow shallow respirations, or a weak, irregular pulse appear. The room must be free of drafts, and temperature must be at about 72° F. Tepid (95° F.) water should be used unless otherwise ordered by the physician.

PROCEDURE

1. Uncover only a part of the body at a time; cover the rest with a bath blanket.
2. Put a filled ice cap on patient's head.
3. Leave enough water in the washcloth to squeeze out a little over the area to be bathed. It is the evaporation of the water that accomplishes the cooling goals.
4. Begin at the hairline, then go down the neck, over the shoulder, and outside of the arm and hand.
5. Turn or rinse the cloth, then bathe the inside of the arm and down the chest.
6. Sponge the axilla and the groin, which have large blood vessels, 4 or 5 times.
7. Pat the skin dry or cover with a bath blanket.
8. Proceed to the other side, then turn the patient prone, if possible, or on his side.
9. Go over the buttocks 4 or 5 times.

NOTE

Procedure 4 through 9 will normally be repeated a couple of times during the 20 minutes.

10. Dry the child, remove bath blanket, and cover.
11. Leave ice cap on for another 20 minutes.
12. Check TPR immediately after the sponge and again 30 minutes after the sponge.
13. Record results.

NOTE

Sponging may have to be reinstituted

after a few minutes rest for the child if it is not effective the first time. Once the temperature starts to fall, it will usually continue down a little further after the treatment is stopped.

10–36. Feeding Child with a Cleft Palate

a. Cleft Palate Nipple. Until a cleft palate is repaired, the cleft palate nipple (fig. 10–7) may be used. The specialist inserts the nipple in the infant's mouth with rubber flange (cut to the size of the cleft in the palate) over the fissure area. This makes it possible to create a vacuum in the mouth and prevent aspiration.

b. Medicine Dropper or Syringe. The specialist will have to allow more time than the 20 or 30 minutes required to feed a normal baby by bottle.

EQUIPMENT

Sterile medicine dropper with rubber tip
or
Asepto syringe with rubber tip
Warmed formula
Bib
Protective covering for specialist

PROCEDURE

1. Wash hands and insure that the infant is dry and comfortable. Mummy-wrap infant.
2. Add the formula to the medicine dropper or syringe.
3. Hold infant in sitting position.
4. Place the rubber tip on top and to the side of the tongue. Fluid should flow from the dropper slowly and in small amounts.
5. Allow the infant to swallow before giving more formula. If possible, do not permit sucking motions.
6. Burp frequently. If the infant can hold his head up strongly, sit him up, support his chest with one hand, and gently pat his back with the other. Otherwise burp as described in paragraph 10–20*a*(2).
7. After feeding, put the infant in his crib on his right side with his back supported by a rolled infant blanket or small pillow.
8. Record results of feeding.

c. Gavage.

EQUIPMENT

Small catheter or polyethylene gavage tube or No. 8 infant feeding tube
Syringe, 30 ml. or 50 ml.
Cup of water, 1
Small towel
Adhesive tape
Warmed formula

PROCEDURE

CAUTION

This can be a dangerous procedure for the inexperienced specialist and should be performed only under the supervision of the nurse or physician.

1. With the catheter to be used for the gavage, measure the distance from the bridge of the infant's nose to a point halfway between the xiphoid process (base of breastbone) and the umbilicus. Mark the tube.
2. Put the infant in a mummy restraint and put a small towel roll under his shoulder to hyperflex his neck.
3. Hold the infant's head with one hand to keep him still, and gently pass the catheter through his nose or mouth, depending on the physician's orders, until the preselected mark has been reached.
4. Stop and remove catheter at once if the infant chokes, coughs, or becomes cyanotic. Reinsert the tube only on the direction of the nurse or physician.
5. Secure the inserted tube to the infant's face with nonallergic tape.
6. Depending upon local policy, leave the tube in place between feedings. If it is left, however, test the position of the gavage tube before each feeding (to assure that it is not in the respiratory tract) by one of these methods—
   a. Attach a syringe to the gavage tube and withdraw a small amount of stomach contents. This insures that the tube is in the stomach.
   b. Place a stethoscope over the epigastric region, insert 0.5 ml. of air through the tube with a syringe, and listen to see if the air enters the stomach.
   c. Invert the gavage tube in a glass of water. If bubbles appear, withdraw the tube, as it is *not* in the stomach.
7. Attach a syringe barrel to the tubing.
8. Pour a small amount of warmed formula into the barrel.
9. Raise the syringe barrel about 8 inches above the *mattress* and let it flow by gravity slowly.
10. Just before the syringe empties, pinch the tube to prevent air from entering the stom-

ach and add more formula to the syringe barrel. Do *not* overfeed, or the infant will vomit.
11. Follow feeding with a small amount of sterile water.
12. Remove gavage tube by clamping it, removing adhesive tape, and withdrawing quickly and smoothly.

10-37. Retention Catheters

The specialist may assist the nurse in this procedure, but his main responsibility will be in aftercare. He must watch for kinked tubes and be careful not to pull the catheter when caring for the child. Cleanliness is important, especially after the child has a stool.

10-38. Enemas

If the hospital does not have a prepared pediatric disposable enema, be sure that enema can or asepto syringe and tubing are sterile.

PROCEDURE FOR SMALL CHILD

1. Position the child. Put a pillow under his head and back to maintain alinement.
2. Use a child-sized bedpan, pad it, and place under his buttocks. (If desired for security, put a diaper under the bedpan and bring over the child's thighs and pin.)
3. Expel air by running solution through tubing.
4. Select a small catheter and lubricate it.
5. Insert 1½ to 3 inches into the rectum (the distance depends on child's size).
6. Elevate the asepto syringe with the measured, ordered solution just far enough to let the solution flow into the rectum. Only a small amount of solution is used.
7. Wait for returns to cease.
8. Cleanse child.
9. Cleanse equipment.

PRECAUTIONS

- Use a soft rubber catheter.
- Do not inject fluid until catheter is fully inserted.
- Do not use tap water—use normal saline or as prescribed by the doctor.

10-39. Instilling Eye Drops

a. Restrain child if necessary.

b. Use one of the following methods—

(1) If only one specialist is present—

(*a*) Gently spread the eyelids with the thumb and forefinger of one hand (fig. 10-17).

(*b*) Check medication label.

(*c*) Use other hand to instill drops.

(*d*) Instill drops on lower lid and direct the stream from the inner canther outward.

(*e*) Hold eye open for a few moments to allow medication to spread over the surface of the eye.

(2) If two specialists are present—

(*a*) The first specialist—

- Places one finger upon the child's lids near the upper lashes and another finger over the lower lashes.
- Gently separates the lids.

(*b*) The second specialist checks medication label, then instills the drops on the lower lid.

(*c*) The first specialist holds the eye open for a few moments.

c. Observe these precautions—

(1) Hold both eyelids open. If only the lower lid is held open, the drops may be forced out of the eye by the blinking of the upper lid.

(2) Do not force the eyelids apart as this can cause trauma to the eye.

(3) Remind the child not to touch or rub his eyes.

10-40. Instilling Ear Drops—Infants and Young Children

a. Check medication label, then warm ear drops to body temperature unless the doctor's orders specify differently.

b. Restrain the child if necessary.

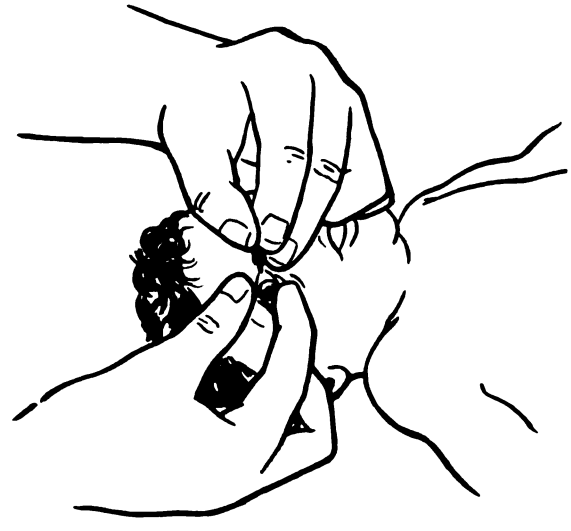


Figure 10-17. Instillation of eye drops.

c. Pull the pinna of the ear *down* and *back.*

d. Instill the warmed drops. Allow to fall on the external canal and run into ear.

e. Have the child lie down until drops are absorbed.

f. Lubricate the skin around the ear to keep it from being damaged by drainage.

g. Turn the child to the affected side and let the ear drain properly.

h. Record—

- Type of drug or oil instilled.
- Number of drops.
- Ear in which drops were instilled (right or left).
- Any reaction, therapeutic or untoward.

NOTE

For older children, instill ear drops as for an adult, with the pinna being held *back* and *up.*

10–41. Traction

a. Bryant's Traction. In this type of traction, skin traction is applied to both legs (fig. 10–6). Just enough weight is used to barely lift the buttocks off the mattress; the child should not be unduly elevated. A diaper can be placed underneath (but NEVER between) the legs. The front of the spreaders can be taped together to keep the toes pointing straight ahead.

b. Dunlop's Lateral Traction. This type of traction is used for supracondylar (above the elbow) fractures of the humerus. The elbow is either bent at a right angle or slightly extended, and the lines of pull are along the elbow at a right angle to the body's trunk. The forearm is held up by a second weight; another weight hangs from a padded cuff on the arm (fig. 10–18). The bed is tilted away from the injured arm or the child's body rests against heavy side rails—this overcomes the sideway pull.

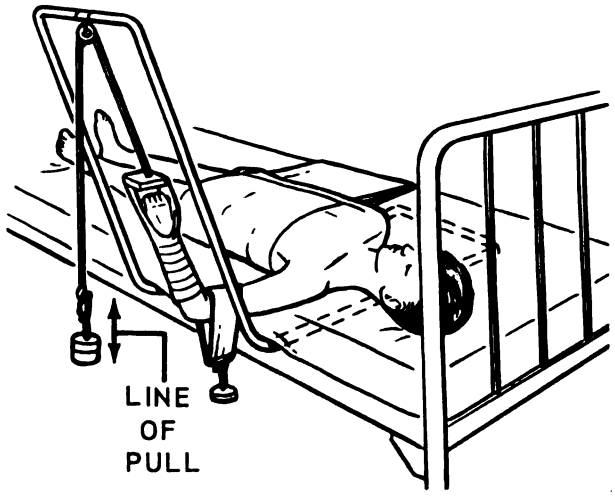


Figure 10–18. Dunlop's lateral traction.

c. Putti Splint. Two boards are hinged together at one end with a wheel-like pulley at each opposite end (fig. 10–11). The hinged point is padded, and then waterproof mateial is placed over that. This waterproofing material must be washed and dried a MINIMUM of once a day.

PROCEDURE

1. Place the child's perineum on the hinged point with a diaper over the perineum in loin-cloth fashion. The interior of the legs lie along the board.
2. Apply traction as ordered, starting above each knee. This traction extends to the pulley on each side.
3. Attach four straps to each leg: one above the ankle, one below and one above the knee, and one near the groin. Thread each strap through felt or sponge rubber to reduce pressure on the skin.
   - Frequently inspect the outside wrapping to be sure it is not telescoping (the bandage bunching over knee, ankles, or foot) and is dry; look at the feet for color and edema and touch for temperature; and test the traction ropes to see if they are taut.
   - When the child is supine, be sure there is a board under the mattress and a firm pillow under the buttocks to maintain alinement. To keep the child from falling out of the crib (since both crib sides must be down), tie the splint on both sides to the lowered crib sides. Do not permit the patient's heels to touch the bed—use sandbags or rolled towels to elevate them.
4. Turn the child three times a day. Turning requires two people, one on each side of the crib.
   a. The child is pulled to the edge of the bed away from No. 1 specialist, who is to receive the child.
   b. No. 1 specialist slips one hand and arm under the patient just below the shoulders and uses the other hand to grasp the splinted leg that is the farthest away.
   c. No. 2 specialist, who is nearest to the

child, places one hand under the buttocks and the other hand on top of his chest.

d. The specialists lift together and turn the child in midair, being sure the splint does not touch the bed.

e. The toes are checked to be sure they are not pinched or bent under.

f. If the child is placed on his abdomen, a pillow is put under his chest and a thinner pillow under his abdomen near the hips to maintain alinement.

5. To place the child upon a bedpan, use extreme caution as the skin in this area is easily damaged.

a. Release the top straps near the groin.

b. If the patient is female, place one hand on the mons veneris and labia, and then push them back and up toward the abdomen. With the opposite hand on the Putti, push down and pull the point of the Putti up.

c. If the patient is male, the top of the Putti rests behind the scrotum, so lift up the scrotum and penis toward the abdomen and push down and pull the point of the Putti up to place the child on the bedpan.

d. Inspect the perineum when the Putti is released. Wash the perineum and genitalia with clear water each time the bedpan is used. (The skin is also inspected after a bath and the perineum and genitalia are thoroughly washed.)

10-42. Care of the Burned Child

a. Bath Therapy. The physician may order immersion of the burned child in a bathtub or arm tub (obtainable from the Physical Therapy Section). The tub or tank should be thoroughly cleaned with a detergent-disinfectant cleansing agent such as "A-33, Air-Kem" * prior to placing child in tub or tank, or burned areas may be washed with soap and water. Perineal care should be given as needed, at least once daily. The procedure for bath therapy is given below.

PROCEDURE

1. Fill tub or tank one-half full with warm tap water or a solution as ordered by the doctor.
2. Place a clean sheet on a litter or wheelchair.
3. Put on a pair of sterile gloves. (It is assumed that the specialist will be wearing scrub-type clothing or a gown.)
4. Lift the child from the bed and place on litter or wheelchair. Be certain that catheter and intravenous tubing, if present, are properly secured.
5. Take child to the tank or tub. If dressings are in place, cut the bandages holding them and remove loose dressings.
6. Change into fresh sterile gloves. Lift child and immerse him in tank or tub. Be certain his head is adequately supported. Reassure the child during the entire procedure.
7. Wearing sterile gloves, remove the dressings gently, after they have been well soaked.
8. Using sterile 4- by 8-inch dressings, gently wash the burned areas and rinse well. Assist the physician as necessary whenever he debrides the burn wound.
9. Complete the bath and shampoo the hair, rinsing well. Lift child from the tank or tub and place on litter or in wheelchair.
10. Return child to bed.
11. If dressings are ordered or an ointment is to be applied, wear a pair of sterile gloves and a surgical mask when doing these treatments.

b. Application of Burn Dressing.

PROCEDURE

1. Set up a sterile dressing tray with a basin, 4- by 8-inch gauze squares, fine mesh gauze, scissors, and other equipment as ordered by the doctor. Cover tray with sterile towels. Prepare and warm the sterile solution as ordered by the doctor.
2. Place the covered dressing tray, the warm sterile solution, a surgical mask, and a pair of sterile gloves at the patient's bedside.
3. When the patient is ready to have the dressings applied, uncover the tray and place the sterile surface of the towels under the burned area that is to be dressed.
4. Pour the warm sterile solution into the sterile basin.
5. Put on the surgical mask and the sterile gloves.
6. Immerse the roll of fine mesh gauze, if ordered as a part of the dressing, in the solution. Roll the gauze about the extremity and cut it so that single, separate layers of gauze cover the burn wound.
7. Immerse the 4- by 8-inch dressings in the

* Suggested proportions of "A-33, Air-Kem"—dry powder, 1 pre-packaged container per gallon of water; liquid, 6 ounces per gallon of water. The tub or tank must be thoroughly rinsed following the cleansing with the detergent-disinfectant solution.

solution, squeeze them fairly dry, and open each 4- by 8-inch dressing lengthwise.

8. Place opened 4- by 8-inch dressings over the burned area.
9. Hold the dressing in place by using 3- to 4-inch roller bandage (Curlex). Apply without pressure. No elasticized bandages are to be used unless specifically ordered by the doctor.
10. Moisten and change dressings as ordered, using a sterile bulb syringe, a sterile basin, and warm sterile solution. Always be certain dressings are moist before removing them.

★Section VIII. OBTAINING SPECIMENS

10–43. Urinary Specimens—Clean

These are collected in the morning and are among the most important specimens obtained. They are examined for sugar, specific gravity, and blood cells. Because of their importance, it is necessary to obtain a clean specimen, a requirement that necessitates use of special equipment for a child in diapers or any young child. After an operation, output must be observed carefully because it is an index of kidney function and fluid balance. Former methods involved using test tubes for boys (fig. 10–19Ⓐ and a spicer urinal or birdseed cup for girls (fig. 10–19Ⓑ). Now, commercially available, sterile, plastic bags that are disposable are generally used (fig. 10–20).

PROCEDURE FOR COMMERCIAL URINE COLLECTORS

1. Cleanse with soap and water, using normal precaution of washing away from the urethral meatus.
2. Dry. If collection is to be prolonged, paint with tincture of benzoin.
3. If the child is active, get someone to hold the child's legs in abduction.
4. Peel off the gummed backing from the disposable collector and press the adhesive portion firmly against the perineum of the infant around the urethra (fig. 10–20). For girls, be sure to make the adhesive adhere to the strip of skin between the anus and vagina.

10–44. Urinary Specimens—Sterile

If the child is old enough to understand and under close supervision, a clean voided specimen can be obtained by "midstream catch."

CAUTION

Be sure to cleanse the urethral orifice first. Clean catch urines can be used for female infants if good technique is used. Catheterization should be avoided, if at all possible.

10–45. Stool Specimens

Specimens should be collected in the morning. The infant's peri-anal area should be cleansed before collection of a stool specimen. The procedure for an adult would be used for an older child who can

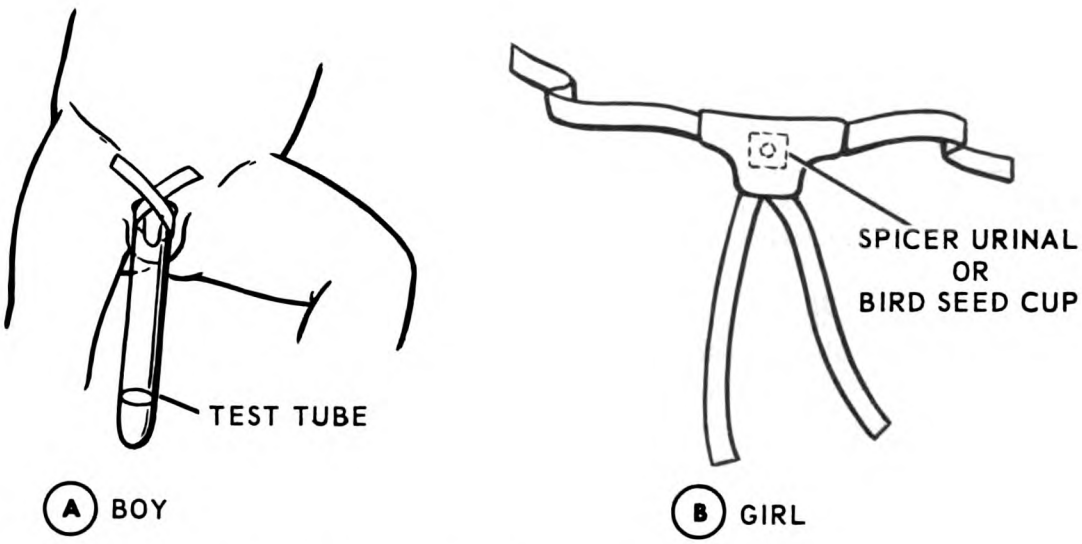


Figure 10–19. Methods of collecting urine specimens.

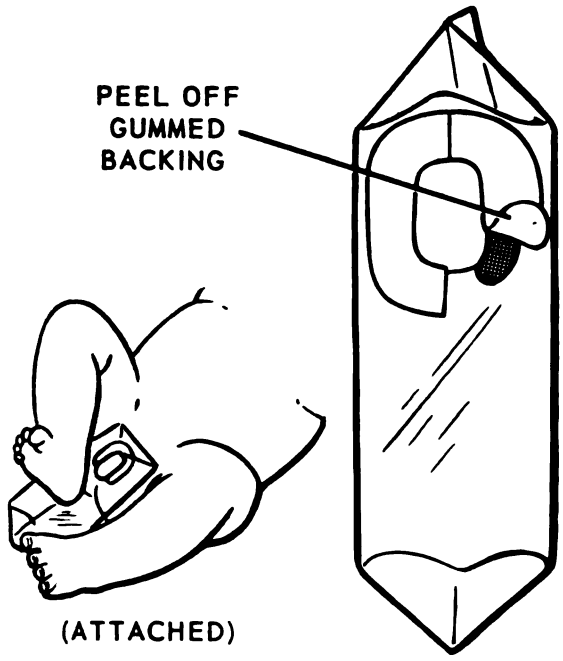


Figure 10–20. Commercial urine collector.

cooperate. The infant's stool may be scraped from the diaper with tongue blades and placed in a covered specimen cup. It must not be contaminated by urine, so special precautions may need to be taken. Place the soiled tongue blade in trash receptacle. Do not attempt to flush down hopper. Freshly passed specimens should be taken to the laboratory as soon as possible.

10–46. Blood Specimens

Blood specimens are obtained from children by the same method used for adults (para 5–60 through 5–62); however, the site of the puncture and the veins used are different. The veins used for infants and young children are normally the external jugular or the femoral. In the jugular venipuncture, the child is usually put in a mummy restraint and his head lowered over the side of the bed. The specialist holds the infant's head steady with his hands (fig. 10–21). When the procedure is finished, pressure is maintained on site and the child is elevated to a sitting position until the bleeding stops. In the femoral venipuncture, the infant is put on his back with his legs spread out as shown in figure 10–22 and his legs restrained by the specialist. After the procedure, pressure is maintained on the site until the bleeding stops. The specialist only assists with this procedure.

Figure 10–21. Position for jugular venipuncture.

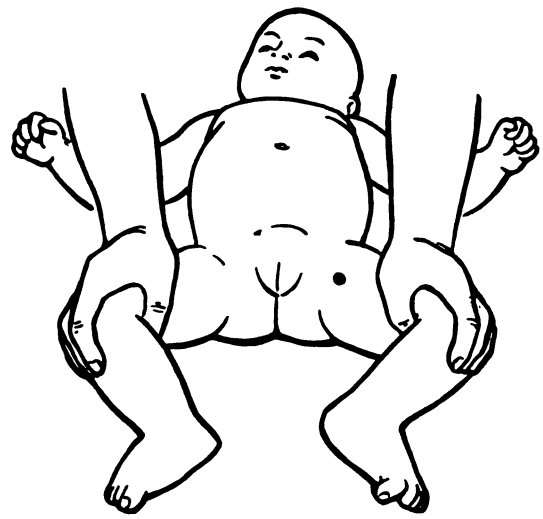


Figure 10–22. Position for femoral puncture.

Figure 10–23. Position for lumbar puncture.

10–47. Lumbar Puncture

When an infant must be positioned for a lumbar puncture, the child's lower limbs must be put in a sheet restraint. He is held as shown in figure 10–23, with his neck and knees flexed.

10–48. Subdural Tap

Before the anterior fontanelle has closed, a needle may be inserted directly into the subdural space

on the brain's surface for diagnostic or for therapeutic purposes (when abnormal fluid is removed).

EQUIPMENT

Tray with—
- Local anesthesia
- Sterile 25-gage hypodermic needles
- No. 22 needle with stylets
- Sheet
- Antiseptic

PROCEDURE

1. Put the infant in a mummy restraint.
2. Shave and wash his head as directed by the doctor or nurse.
3. Hold him across the treatment table facing the doctor. Support his head firmly. (The doctor will apply the antiseptic, infiltrate the skin, and insert the needle to remove fluid, if any, from the subdural space.)
4. Measure and record the volume removed.
5. Obtain specimens for culture and chemical analysis.

NOTE

Pressure on the scalp is usually enough to seal the puncture, so dressings are not normally required. Collodion may be used to insure the closure of the wound.

6. Observe for any leakage.
7. Watch vital signs.

★Section IX. PREOPERATIVE AND POSTOPERATIVE CARE

10–49. Surgery

a. General. If surgery must be performed, the danger of psychological trauma to the child is even greater than that for hospitalization for illness. He requires special care and attention. In an emergency, there is no time to prepare the child or his parents, but a calm, reassuring attitude on the part of hospital personnel will help both parent and child. However, if the operation is elective, he must have intelligent preparation and explanation. A friendly relationship should have already been established with the doctors, nurses, and specialists, and perhaps a tour of the hospital has been made. But no matter what preparations have been made, he will sense tensions and respond to them, particularly those of his parents, whose fears are easily communicated to their child. The length of time the parents are permitted to remain with him may have to depend on their own emotional states. Attention to the child's needs come first and are always a matter of judgment, as well as a sympathetic attitude.

b. Preparation. The child should be told if he is not allowed to eat or drink for a period before and after the operation and that his temperature may be taken rectally. He should also be told about blood pressure readings, enemas, anesthesia, the operating room, and people in masks. Try to make a game of wearing a mask, the child listening to the stethoscope, etc. For example, have a child try on a mask and perhaps tell him he looks like a jet pilot. The anesthesiologist or nurse anesthetist will probably visit him and explain what will happen in the operating room. Minimize pain as far as possible and do not initiate use of the word. Words such as "pain," "shot," and "hurt," are anxiety producing; substitute "smart," "sting," and "uncomfortable." If he mentions pain or suffering, assure him that he will not be allowed to suffer and that he will be returned to the same room and bed after the operation, even if he spends some time in intensive care. Unless reassurance is given skillfully, your relationship with the child and even the relationship between the child and his parents may be damaged beyond repair. What you should tell the child, and when, will depend upon the child—his age, condition and intelligence—but he should be told that he will be given all the help he will need. Above all, nursing personnel must respond truthfully (but not bluntly—choose your words with care) to any question and make simple explanations such as, "We are going to fix that place so it will quit hurting in a few days." Older children should have more detailed explanations. These children may be undergoing something similar to a combat neurosis, and every effort should be expended to explain what they will see, what will happen, and where they will be when they wake up. Make every attempt to assuage their anxiety. If the admitting specialist finds out the child's favorite food, perhaps he can surprise the child with it in his last meal before the operation. A young child might be permitted to carry a favorite toy or other "security" object to the operating room.

10–50. NPO

An NPO order requires special effort where a child is involved. Because the child lacks judgment, the specialist must be ever watchful to be sure the child eats or drinks nothing. The child should be kept in bed and accompanied to the bathroom by a specialist for supervision. Because a child will be fretful without water or food, his parents' pity may be aroused to the point where they will slip him water—or other children may share their breakfast trays. If you find out that food or water has been given to him, notify the nurse in charge, who will notify the operating room so the operation can be postponed. The order is so important because fluid can regurgitate silently and be aspirated during anesthesia, which would result in postoperative pneumonia. The child might vomit, too, and aspirate it. Age is also important in this order. The stomach of an infant ander 1 year normally empties in 4 hours, but even an infant should be limited to clear liquid with sugar added for several hours longer than this. The stomach of a child above that age, as well as an adult, requires a minimum of 8 hours to empty. This time can be extended by fear, trauma, or gastrointestinal disease, which may require use of a Levin tube to empty the stomach.

10–51. Special Care

a. Day of Operation. The usual hospital procedures are followed. Any signs of a cold must be reported to the nurse immediately. The child should be inspected for skin rash or a nasal discharge. If an older child is thirsty, he might be permitted to rinse his mouth, but be sure he swallows no water. The specialist might wipe the lips of a small child. He should be made comfortable and be supervised by someone he knows and trusts.

b. Postoperative Day. A child chills easier than an adult and is more susceptible to exposure and to trauma, so he will need expert nursing care. When he awakes, he should see someone he knows and trusts, preferably the same person who accompanied him to the operating room. When he wakes up, he may be frightened and try to tear off dressings or climb out of bed, so he must be watched constantly. After surgery or during a period of illness, he must also be watched for changes in his physical condition.

10–52. Postoperative Positioning

After an operation, the child is placed on his side or abdomen to allow secretions to drain and to keep the tongue from going back and obstructing the pharynx (fig. 5–80, except that his arm will be under his head).

10–53. Dressings

Dressings are generally used only on open wounds, infected incisions, or incisions that might be contaminated by excrement. A clean surgical wound usually has hidden stitches and is sprayed with plastic or covered with a lightweight bandage that does not adhere. If a dressing is used, select only individually packaged sterile gauze squares or pads. Do not change dressings on an open ward—do this only in a treatment room or private room. The patient must be protected from infection; however, if infection is already present, nursing personnel must insure that it is not spread. Two specialists are needed in addition to the doctor or nurse. One specialist gently holds the child while he tells stories or offers toys. The other specialist scrubs his hands and dries them with a sterile towel. The older child is asked to remove his own adhesive tape, but if he will not, the specialist picks up one edge and pushes the skin down and away (it is never torn off rapidly). Any gauze that is stuck is soaked in saline. The contaminated dressings are put in a plastic bag within a foot-operated wastebasket with *gloved* hands or with an *instrument.* The skin around the wound is washed with warm water and soap; the wound is irrigated, if ordered; and re-covered. If the dressing must be changed often, Montgomery strips are used or nonallergenic tape.

CAUTION

This entire procedure must be done with kindness and care.

10–54. Bleeding

Bleeding may occur after an operation so the child must be watched carefully for 24 hours. Just 20 percent loss of blood—a very small amount—in a child can result in shock. Watch for changes in vital signs, for shock, for cyanosis, and for evidence of bleeding.

10–55. Special Care for Patients in Casts

a. Circulation. Since swelling is always associated with injury or surgery to a bone, the doctor will pad the cast inside and order elevation of an extremity. He may also order that a bedboard be placed under the mattress to prevent sagging. But

nursing personnel bear a special responsibility to see that circulation is not impaired. As soon as the cast is applied, the specialist should observe the color of the fingers or toes and if any pulse is exposed, palpate it. Another good test is to press on the nail beds and watch for blanching and prompt return of color. Swelling, pallor, or numbness of the digits are also signs of trouble. The ability to detect sensation can be checked by lightly drawing a small piece of gauze against the exposed skin. Pain is a symptom of a tight cast, particularly a general or burning pain. Pain severe enough to wake up the child or that is increased by attempts to move the digits should be checked immediately. But pain in children is not easy to evaluate—the cutaneous nerves can be destroyed and pain will lessen, or the child may be complaining just to get attention. That is why extra vigilance is necessary. Two other clues to possible trouble are local soreness or tightness of the cast and failure to find a previously palpable distal pulse.

b. Care of the Cast. In addition to the information on cast care given in paragraphs 5–119 through 5–126, special precautions must be taken with children. The rough edges of a plaster cast may injure the child's skin, so petalling (fig. 5–98) is used to prevent irritation. Waterproofing of the cast and of the petalling are required for infants and for young children who cannot control elimination, and the head of the bed is also elevated a little to prevent seepage. Foreign particles can be put into a cast by the child, so toys small enough to be pushed under it are not used. Fluffy cotton padding tucked at the edges of the cast (fig. 10–24) will help prevent the child from putting objects under the cast. The exposed skin should be checked every day for irritations, as the child may devise ingenious ways of scratching the itching skin under the cast. Areas at the edges of spica and body casts at the top and back (and at the groin with long leg casts) must be washed with soap and water as far inside the cast as can be reached and then massaged with alcohol, followed by a rub with an emollient cream. A small hand vacuum cleaner can be used to remove some crumbs. Turning the child will give him exercise and prevent pressure sores. Pillows or sandbags must be rearranged with each position shift. Help may be needed. Feeding may present problems where casts extend from the abdomen to the neck, because the child is unable to swallow while supine. If he is placed in a prone position and chest propped up with pillows, the older child may even be able to feed himself. As for toilet care, casts on infants should have the additional protection of plastic tucked under the cast's edges in the perineal area and then covered with a diaper. Disposable paper, plastic-backed diapers will help, or the infant can be put in the prone position on a small frame over a diaper or bedpan, with some elevation of his head. Older children may have trouble with elimination when in a supine position. One way of helping a child is to elevate the head of the bed and to lift him on a bedpan while he holds himself up with an overhead bar. Considerable tact may be required because of an older child's shyness and aversion to exposure.

10–56. Special Care for Cardiac Patient

a. Preoperative Care. The child admitted to the hospital for cardiac surgery usually has been hospitalized previously for diagnostic studies and his reaction to this admission will depend upon whether the experience was a good or bad one. The specialist must help the child understand and accept his condition. This will be difficult as the child will be mentally upset and afraid of being hurt. All necessary procedures should be explained to the child in a manner which he understands.

b. Postoperative Nursing Care. All nursing care for cardiac patients is under the supervision of a nurse. Immediately after surgery (during the first

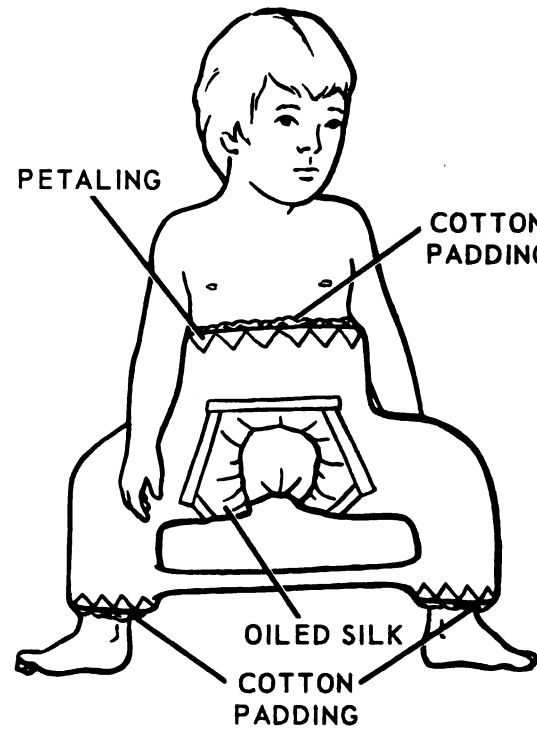


Figure 10–24. Cotton padding, spica cast.

few minutes), the child is checked for vital signs, skin color, respiration, level of consciousness, and movement of extremities. The team will then carry out the surgeon's orders, which may include the following:

(1) Start oxygen therapy.

(2) Connect water seal bottle drainage.

(3) Connect the urinary catheter to a sterile closed drainage system.

(4) Prepare medications and intravenous fluids.

(5) Check vital signs every 15 minutes until bleeding from chest tube stops and child has fully reacted.

Once these emergency care procedures have been accomplished, the team will review special problems with the surgeon. If a child has a tracheostomy, the team will verbally assure him that its members will be with him constantly.

10–57. Special Care following Surgery for a Cleft Palate

Closure of the palate is usually done in two stages. The closure of the anterior hard palate may be done when the child is 6 to 12 months of age; the second stage closure of the soft palate, when the child is 1 to 2 years of age.

PROCEDURE

1. Irrigate mouth with saline solutions if ordered by the surgeon.
2. Aspirate nasopharynx to keep it clear.
3. Give adequate nutrition. Keep the suture line clean after feeding by using water from a cup or medicine glass.
4. Put the infant on his *back* and apply elbow restraints if necessary to prevent him from damaging the operative site.

CAUTION

Close observation is necessary due to danger of aspiration. Head and shoulder should be elevated slightly.

★Section X. EMERGENCY CARE

10–58. Mouth-to-Mouth Resuscitation

The correct technique for infants and small children is covered in paragraph 8–5.

10–59. Closed-Chest Heart Massage

This may be done in combination with mouth-to-mouth resuscitation, preferably with an assistant. This procedure is modified for an infant or small child (para 8–10). Another method requires use of a firm support that is slid under the child and compression of the sternum with both hands, with the arms held straight. Minor force is used with an infant, but an older child's sternum is depressed 1½ inches. As soon as possible, a doctor should be sent for, and emergency drugs and a cardiac defibrillator should be at hand ready for his use.

10–60. Resuscitation Equipment

a. The Kreiselman Resuscitator (Fig. 10–25).

(1) *On-off switch.* This switch is turned on to give warmth for the body.

(2) *Suction switch.* This controls the electric suction apparatus.

(3) *Oxygen cylinders.* These fit into a groove at the foot of the unit. The supply of oxygen must be checked at the beginning of each shift.

(4) *Oxygen gauge.* This indicates the pressure in the cylinder that is connected to the regular *oxygen mask.* Turn the handle clockwise and oxygen will flow from the tank.

(5) *Positive pressure gauge.* The oxygen pressure in the cylinder attached to the positive pressure mask is shown by this gauge. The handle of the mask *must be depressed* before the oxygen will flow.

WARNING

A specialist should never administer this positive pressure to a child unless under the supervision of a physician or nurse.

(6) *Mattress adjuster.* The handle can be moved to other grooves to change the mattress to the Trendelenburg position.

(7) *Flow meter.* This controls the rate of oxygen flow to the oxygen mask.

(8) *Suction apparatus.* The meter on top of the jar, which can be unscrewed for cleaning, shows the amount of vacuum used during suction.

(9) *Drawer.* This stores suction catheters and intubation tubes.

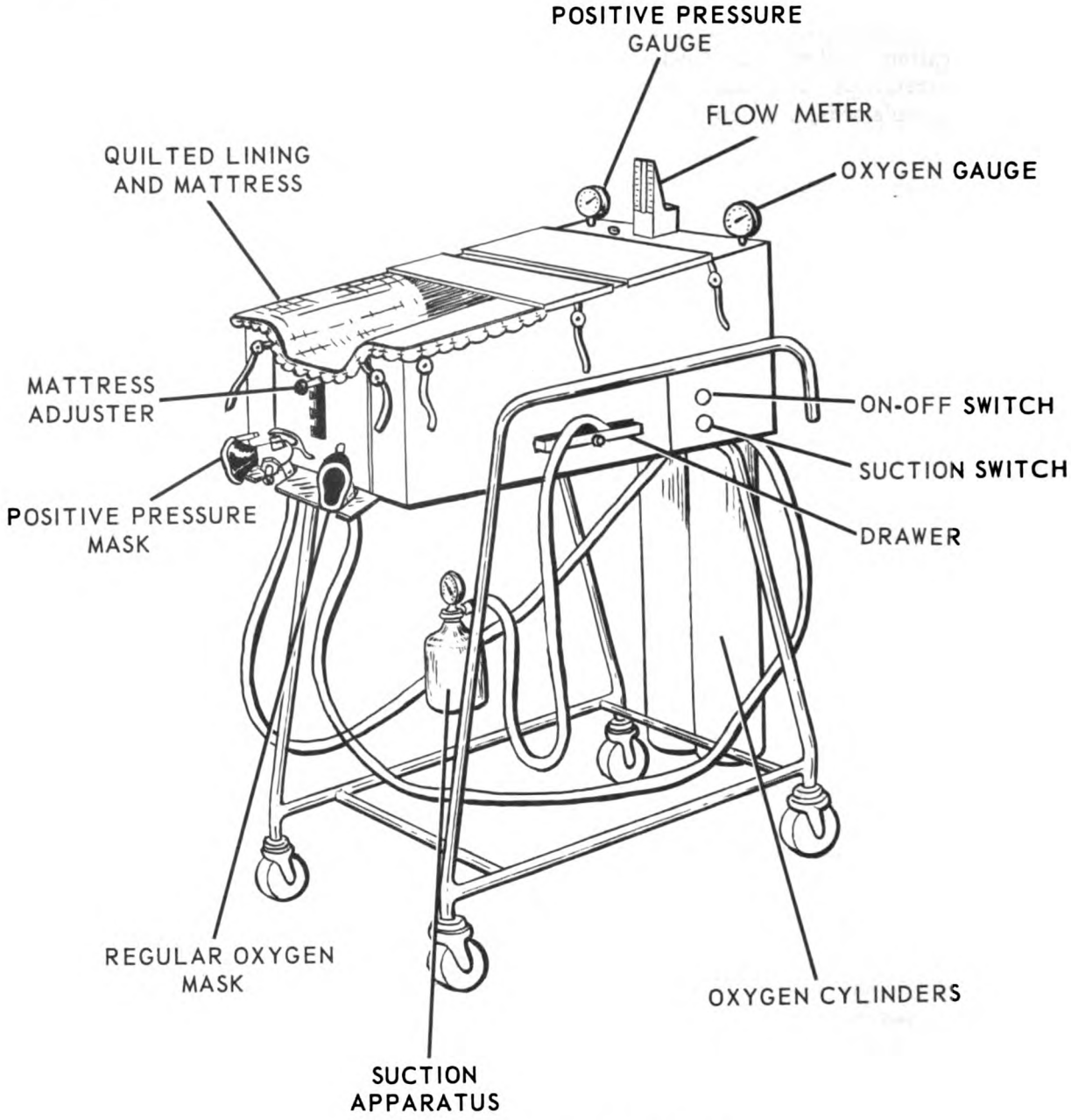


Figure 10–25. The Kreiselman resuscitator.

b. Other Resuscitators. Other resuscitators are shown in figures 10–26 and 10–27. The portable resuscitator has an automatic valve that prevents rebreathing expired air. The mask may be used with oxygen or air. To use the Emerson bellows resuscitator, open the valve, blow into the tube, and close the valve to inflate the rubber face cushion. Put the narrow end over the child's nose and press firmly. Hold securely with one hand and compress the bellows rhythmically and gently (less than full capacity); rate will vary with the child's age. Bellows can be held against the body or put on a flat surface.

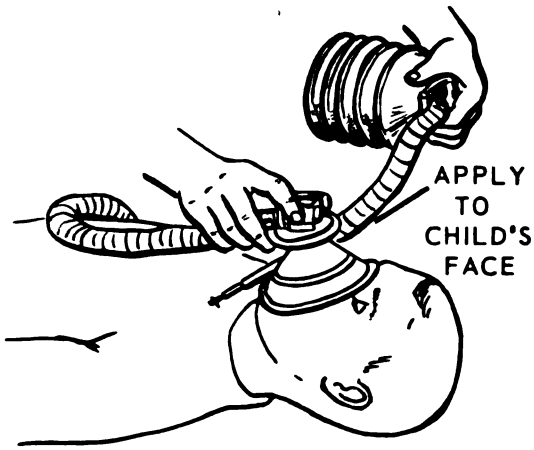


Figure 10-26. The Emerson bellows resuscitator.

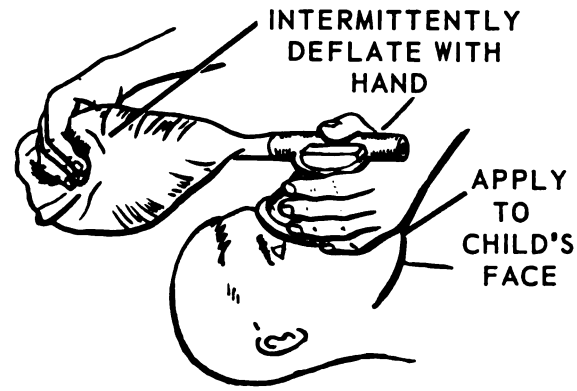


Figure 10-27. The portable resuscitator.

★Section XI. DEATH OR DISCHARGE OF CHILD

10-61. Death of a Child

Death is always sad wherever it occurs, but the death of a child in the hospital will have a traumatic effect on the parents, on other children, and on nursing personnel.

a. Parents. Nursing personnel must give emotional support and comfort to the parents of a dying child. Parents will have many fears and may particularly feel that they need to confide in you. It is absolutely necessary that nursing personnel know what the doctor has told them because you may well become the person who translates the care and procedures to the parents.

CAUTION

Under no circumstances should a specialist be the first to inform a parent that a child will not recover or that he is dying. Go no further in your translation than the instructions given to you.

Explanations may need to be repeated again and again, and even then misunderstandings may occur. The parents must be reminded of the need to give other children, if any, as normal a home as possible under the circumstances. Above all, any possible feelings of guilt by the parents must be assuaged. Parents should be encouraged to enliven the child's days with small gifts and surprises. If at all possible, both from the doctor's and the parents' point of view, permit the parents to participate in the care of their child. When death comes, they should be reassured that everything possible was done for their child. Many parents will appreciate a chaplain of their faith being summoned when the child's death seems imminent.

b. The Dying Child. The child himself must neither be overprotected nor ignored, but during night hours, you can comfort a frightened child with your presence and perhaps close physical contact. He may want to know if he is going to die —and probably already knows, whether you tell him or not. Although the truth is generally best, the decision is made by the doctor and parents. The specialist must follow the direction of the nurse in caring for the dying child. Each situation will probably be handled in a different manner, depending upon the age of the child, the reaction of the parents, or the child's previous experience with death. The specialist can anticipate questions, and he should seek guidance from the nurse. It should be remembered that death is a natural thing—that everyone dies, but no one knows when he will die. All Christian children will appreciate a reaffirmation of the love of God and of a future life. Many of them can meet death calmly and courageously. If the child is a Roman Catholic, a priest must be notified when death seems near in order to have the Last Rites performed. Death of an older person is more easily accepted, yet the dying child needs the support and mature understanding of the specialist. A calm acceptance will enable both the child and his parents to face the inevitable.

c. Other Children. A child's death, if known, usually results in considerable concern among other children on the ward. Usually, after the death of a child, the ward atmosphere is strangely quiet; the other children tend to be very helpful

and unusually good. Days after his death, they may ask about him and may want to know if they are going to die too. Questions about the dead child should be answered truthfully; *for example,* "Yes, Johnnie died. He doesn't hurt any more. He's with God."

d. Procedures After Death. These nursing duties are covered in paragraph 5–91.

10–62. Discharge of a Child

a. The doctor writes the order for discharge and the nurse or specialist, if so directed, notifies the admitting office of the discharge.

b. The nurse obtains the information on followup care from the doctor, writes out instructions for the parents, and also explains them orally. The specialist assists as directed.

c. The child must be returned to his own family. If custody is controversial, court orders may be involved. Check the identification of the parents and the identification band of the child before discharge.

10–63. Referral to Army Health Nurse

a. A child may need the care of an Army Health Nurse after discharge. DA Form 3763 (Army Health Case Referral Record) should be completed and forwarded to the Army Health Nurse prior to the actual discharge of the child, if at all possible. When feasible, the Army Health Nurse may wish to discuss the referral in greater detail with members of the pediatric ward team. The specialists who have cared for the child should be included in this conference.

b. Indications of need for referral are—

(1) Newborns with—
- Congenital anomaly.
- Birth weight under 5½ pounds.
- Birth injury.
- Health problem.
- Parents who need guidance.

(2) Infants and children—

(*a*) Who require—
- A special diet (Diabetic, P.K.U., etc.).
- Dressings.
- Medication by injection.
- Rehabilitation exercise.
- Colostomy care.
- Urine testing.

(*b*) Who have—
- Cerebral palsy.
- Paralysis.
- Cleft palate.
- Battered child syndrome.

CHAPTER 11

GERIATRIC NURSING

Section I. INTRODUCTION

11-1. General

a. Definition of the Aged Person. Chronological age does not make anyone young or old. Some people are young in spirit at age 90; others are old at 21. However, the chronological age of 65 is arbitrarily considered the dividing point between the middle-aged and the aged or old person. This is the age when retirement from active employment generally takes place and when Old Age and Survivors Insurance (Social Security) benefits commence.

b. Geriatric Nursing. Geriatric nursing can be defined as caring for persons aged 65 or older. It cuts across many other fields of nursing, incorporating basic principles of nursing care. The specialist caring for a geriatric patient will utilize principles found in medical-surgical nursing, gynecological nursing, and psychiatric nursing, to mention only a few. Geriatric nursing in many ways is like any other type of nursing, yet in other ways it is different or special. What makes geriatric nursing special or different and how the specialist should act and react when caring for the elderly patient is the purpose of this chapter. Largely, the change lies in the approach, attitude, and personal warmth of nursing personnel, plus a knowledge of the aging process.

c. Importance of Geriatric Nursing. The ability to provide adequate and safe nursing services to the older age group is becoming of paramount importance. Between 1950 and 1980 the percentage of the U.S. population over 65 years of age is expected to quintuple. More and more, elderly persons are found both within the civilian and the military hospital environment; this is expected to continue and even expand. It is a well-known fact that people are living longer. Medical science has made giant strides in the maintenance of health and the prevention of disease, as well as in curing disease and rehabilitating persons following disease or injury.

11-2. Qualities Needed by the Specialist in Geriatric Nursing

a. A specialist who assists with a geriatric patient will need to be emotionally stable and slow to anger, a condition known as maturity. The aged may be talkative, secretive, hostile, rude, and childish, but the specialist must not take their remarks personally. He must try to understand their behavior and react in a nonjudgmental manner.

b. The specialist must express sincere interest and affection for the geriatric patient. Old people recognize and detest insincerity. All nursing personnel should be kind, tolerant, and patient, but geriatric nursing personnel *must* be. These qualities come only when you have gained true respect for yourself; respect will then be given to others.

c. The specialist must also have empathy (a projection of one's own personality into the problems and personality of another; a feeling *with* someone). If a specialist can imagine that he has lost his job, lost his friends, lost his sensory perceptions, lost his home, lost his ability to speak fluently, lost his health, and lost his self-esteem, then he can begin to understand the disagreeable stubborn outbursts of an old person. He must recognize that hostility may be an expression of fear, and stubbornness may be an expression of insecurity. He must also recognize the embarrassment that would follow the failure to do even a simple task for oneself.

d. The specialist cannot become emotionally involved with the patient. Life can be prolonged, but death always awaits the geriatric patient. It requires a special quality to show affection for these old people and yet maintain a realistic acceptance that death will surely come.

e. The specialist must make observations for the nurse and doctor, as he will be with the patient more than they will.

Table 11-1. Physiological Changes

System	Changes	Results in—
Skeletal	Degenerative changes in joints	Pain and stiffness in joint.
	Decalcification—"mineral starvation" or demineralization	Fractures.
Muscular	Less muscular activity	Slumped posture; sagging abdominal muscles; contractures.
Skin-Integumentary	Becomes dry; wrinkled, less elastic. Less oils produced. Baldness. Increased pigmentation.	Traumatized easily. Susceptible to decubitus ulcers.
Circulatory	Degeneration of elastic tissues in blood vessels; thinning of middle layer of arterial wall; deposition of metabolic substances such as calcium and cholesterol on inner layer of arterial wall.	Impaired circulation; slower healing.
Respiratory	Rib cage rigid and less elastic; atrophy of respiratory muscles; lungs smaller; bronchioles less elastic; alveoli larger and less elastic with inner walls; vital capacity reduced.	Lowered efficiency of respiratory system.
Digestive	Less muscle tone; less mobility; less absorption of food; mucous membrane thinner; loss of tone in supportive structures.	Elimination problem; malnutrition; intestinal tissue traumatized.
Urinary	Efficiency of glomeruli reduced; muscular portion of ureter, bladder, and urethra less elastic; loss of tone of supportive structure; less blood supply.	Tissues easier traumatized and subject to infection. Reduced efficiency of urinary system.

11-3. Physiological Changes in the Geriatric Patient

The process of aging begins at birth and stops only with death. It is a very gradual process, yet the changes occur in a fairly predictable pattern, with the rate of change varying from one individual to another. It is a period that is often marked by mental confusion and vagueness. The specialist must consider this confusion and help the patient as much as possible. He must also be aware that the old person's body has undergone many other changes. The physiological changes that are seen in the geriatric patient can be generally classified as loss of elasticity in tissues and a general slowing down of the physiologic process. Table 11-1 illustrates some of the major changes.

11-4. Reaction of Nursing Personnel to Geriatric Patient

a. Some nursing service personnel may express displeasure when assigned to give care to aged people, often making such comments as "I'd much rather take care of an active duty soldier than that old retired sergeant," or "I just don't know how to handle old people." But retired sergeants or old people in general are not a group unto themselves; they are merely people who have grown old as everyone must do. As with any other person, however, they have certain basic needs, and these needs must be met if the optimum benefit from hospitalization is to be realized. Everyone needs recognition, security, and love. The nursing care plan should recognize these needs and try to satisfy them as nursing care is given.

b. As the medical specialist cares for an aged patient, he must remember that the patient is a product of his heredity and long years of environmental pressures. The so-called, well-adjusted older person was probably a well-adjusted adult and child; whereas the so-called poorly adjusted older person who is garrulous at times and seemingly unreasonable was probably a poorly adjusted adult and child. It must be emphasized here that the habits of a lifetime will not be changed lightly or willingly; therefore, changes should be required only when absolutely necessary. *For example,* if an old person is used to having coffee at 5 o'clock every morning, he should be given the coffee at

Table 11-2. Rules for Care of the Aged

DO—	*DO NOT—*
Treat as an individual.	• Do not call old people "grandma" or "grandpa."
Call by name such as Sergeant Brown or Mrs. Green.	• Do not stick to the procedure just for the procedure sake.
Be tolerant, patient, and kind.	• Do not shout.
Speak slowly and distinctly.	• Do not do *everything* for the patient.
Help the patient to help himself.	• Do not ignore so-called minor complaints.
Be extremely observant.	• Do not try to change lifelong habits of eating or sleeping.
Be optimistic.	

the hospital. Any adjustments that must be made should be made by the specialist, not the patient.

11-5. Additional Time Required by the Patient

a. The admission of an aged person on a busy ward can be disruptive. Routines geared to the adult or younger patient just do not meet the needs of the geriatrics patient. Adjustment of the routine and personnel is not without difficulty, but if the medical specialist is to fulfill his responsibility of providing nursing care, it must be done. Older patients cannot and should not be rushed, particularly in the morning. An older patient will take almost twice the time, for example, to prepare for breakfast as the younger patient. As medical specialists, you must be aware of the time involved and plan accordingly.

b. Many times it will seem easier and quicker to do something for the patient, rather than let him do it for himself, because it takes him so long. However, oversolicitous care and too much waiting on a patient will force him into a dependent role, a role he does not want and one that is incompatible with a healthy outlook on life. Avoid the temptation to take over. The aim of nursing care is to permit the patient to do as much for himself as he can, with only a minimum of assistance from nursing personnel. His small accomplishments will mean a lot to him.

Section II. GENERAL NURSING CARE MEASURES

11-6. Bathing and Skin Care

a. Older people do not need to bathe or be bathed daily. In fact, some medical geriatric specialists believe that once or twice weekly is sufficient. As a person ages, the skin dries because less oil is produced. Too frequent bathing might lead to skin irritation. However, areas that are soiled are bathed as needed.

b. If at all possible, the patient should be placed in a tub.

CAUTION

An elderly patient is always assisted to get in and out of a tub.

A tub bath provides an excellent opportunity to exercise all of his joints, as well as make him feel more comfortable. If getting in a tub is not possible, a wooden chair or stool should be placed in the shower or stall and the spray shower used. During the bath, whether in the tub or shower, the patient should be afforded privacy. A call light or bell should be in easy reach, and you should check on him frequently. If you cannot leave a patient because of safety reasons, do not look at him directly, but give the appearance of looking somewhere else in order to spare him embarrassment. If a patient becomes ill during a tub bath, pull the plug in the tub first and look after him. Do not leave him alone; wait for help.

c. If a patient is confined to bed, a bed bath once or twice a week, supplemented by partial bed baths and frequent massage to pressure points (but *not* to extremities) is sufficient. Since aged skin is easily traumatized, massage must be gentle. Use of alcohol should be avoided since it will tend to dry already dry skin. Use of a lanolin-rich lotion, particularly to the pressure point such as heels, elbows, and buttocks, will help. Extremities are not usually massaged because of the danger of disturbing blood clots.

d. Toenails and fingernails need careful attention. When possible, the geritric patient should be encouraged to do his own fingernails. Care of the toenails will probably have to be done by the specialist. Cutting nails or clipping cuticles too short must be avoided. If the toenails are long and horny, the physician should be informed since the services of a podiatrist may be indicated.

CAUTION

Never cut the toenails of a *diabetic* patient without a doctor's order. A break in the skin on the toe of a diabetic patient could lead to an amputation.

e. As a part of the daily routine, men should be encouraged and assisted, if necessary, to shave and to comb their hair. Use of an aromatic aftershave lotion can do much to raise the morale, especially if someone comments on it. Women, likewise, should be encouraged to fix their hair and put on makeup if they usually use it. If patients are unable to do for themselves, then the specialist should attend to these matters.

11-7. Sleep and Rest

a. The aged person needs warm sleeping garments and warm lightweight covers. A bed with adjustable height should be used, whenever available. If only a standard hospital bed is available, a

footstool should be provided for the patient. He should be as comfortable as possible since he does not sleep as soundly as the younger patient. He will often wander up and down the ward corridors in the middle of the night. Because of this, there should be sufficient night personnel on duty and sufficient light for the patient's safety. Some patients will need side rails. A night snack, a glass of warm milk, or early morning coffee will help keep them more contented. Since old people sleep less at night, they tend to take naps during the day. A comfortable chair for them to doze in may rest them more than getting in and out of bed. (In fact, the exertion required for them to get into bed may wake them up.) A tap bell should always be placed near the chair when a patient is sitting up, so that he may use it if needed.

b. More rest is needed by the geriatric patient, yet too much rest can be dangerous, if not fatal. If the doctor permits, get the patient out of bed into a chair or a wheel chair at least daily. This not only aids him physiologically, but also improves his emotional outlook by providing a change of environment.

11-8. Clothing

Part of any admission routine is usually to have the patient remove his own clothing and wear hospital attire. In some situations, it is necessary and desirable to wear hospital pajamas, but to the older patient, loss of his clothing may mean another step down the road of dependence. Sometimes hospital routines must be bent some to allow, *for example*, the patient to wear his "long john's" as pajamas, if that is what he is accustomed to wearing—provided, of course, that he changes them and that either he or his family can care for them. Most older patients will dislike robes; they seem too much like sleeping garments to them. Women will like cotton smocks and men some type of shirt and loose slacks. They will often insist on long underwear—and they are right to do so. It is warmer and prevents skin surfaces from touching which, in turn, prevents chafing and soreness. At all times, clothing for old people should be soft, warm, and easily put on or cared for. Their morale will also be helped by color and style.

11-9. Exercise and Recreation

a. Exercise. Motion and exercise are important aids to circulation of blood and of lymph. It also aids elimination. Inexperienced personnel may be afraid that exercise may hurt the patient; the opposite is true. The aged patient is rarely ever put on complete bedrest. A comfortable rocking chair may be sufficient exercise; however, the doctor will order the most beneficial exercise possible. The nursing care plan should include instructions about exercise or ambulation.

b. Recreation. Old people need to be kept busy. Younger patients, if treated on the ward, can be utilized to interest the older patient in doing some activity, even if it is only talking to the geriatric patient. If possible, a dayroom or a separate room should be set aside for recreational activities. Since old people tire easily and often have limited powers of concentration, these activities must be limited to things that do not confuse or tire them. Games, religious services, and entertainment should be short. Then other factors enter—

- Cost is important. Old people are generally on limited budgets.
- Projects should have a goal—not just be "busy" —perhaps a display, a sale, contest, newspaper coverage, or art show.
- Projects must be simple and individual enough so that each patient can do something. Remember some will be confused, some can work only under directions, some have trembling hands.
- Projects must be safe.

Some suggestions for recreation are group singing (use old familiar songs generally), drawing or painting pictures, dancing, knitting or sewing by hand (even men may enjoy this), quilting, checkers, dominoes, and puzzles.

11-10. Elimination

a. Bowel movements are one of the primary concerns of the elderly. Evacuation *does* become a problem with advancing age. Muscle tone decreases; there is less ability to chew and therefore less bulk in the diet; and exercise is limited. Regularity is important. The specialist can check to find out when the patient usually has a bowel movement. The patient may be accustomed to sitting on a commode for long periods of time. If at all possible, try to maintain his routine and schedule. The specialist should watch closely for signs of impaction such as dribbling diarrhea and notify the nurse if this occurs. In addition, elderly patients need bulk in their diet (whole grain cereals, leafy vegetables, fruit pulps and skins; these must be cooked thoroughly or chopped if patient

has chewing difficulties). Often 5 or 6 prunes in the morning are sufficient to cause a bowel movement, but individual tolerances differ greatly. Some have found their own solution: let them use it, unless contraindicated. Medication for bulk may also be ordered by the doctor. Follow directives for giving this medicine carefully.

WARNING

Be sure to answer signal lights promptly. Older people often cannot wait, especially to urinate. Older male patients may feel more secure if allowed to keep a urinal in the bed or on a chair nearby.

b. Prostate trouble is common among old men. Early symptoms which appear very gradually are frequency, difficulty in initiating the flow, and difficulty in maintaining the flow. Hematuria and the symptoms of cystitis may also occur. Many malignancies occur here, so be sure to report incipient trouble.

11-11. Enemas

Older people need enemas more often than younger people but, if used too often, they will interfere with normal bowel movements and wash out the mucus that lubricates the colon. Enemas are given as for other adults but a bedpan or commode should be at hand as old people cannot always control their bowel movements.

11-12. Nutrition

Eating should be an enjoyable experience. Pleasant conversation, a neat area, and adequate time are essentials for this enjoyment. The food that can be eaten depends on the condition of the teeth. Baby food with added seasonings is used in some cases. Proteins are essential. Also, old people are as apt as children to swallow pieces of bone or gristle and choke. They should be given small servings on an attractive tray, with perhaps a flower, a special name card, and a colorful napkin. If their food must be cut up, do so before serving them to avoid chilling the food and also to avoid embarrassment to the patient. (He may even refuse to feed himself because of his shaking hand. If this happens, try giving him only one food at a time.) Soups and liquids are easier to handle in a lightweight cup from which he can drink. He will probably need help to open such things as milk cartons and individual packets. Whether or not he feeds himself, note what he eats and how much. The specialist should offer fluid at frequent intervals to the elderly patient since the patient may not be able to help himself. Make sure if the patient has dentures that they are in his mouth at meal time. The patient may be too forgetful or too confused to ask for them.

11-13. Communication

a. The older patient may have to be hospitalized at a time when his speaking and hearing ability are beginning to fail. He needs to communicate badly but may not be aware of his difficulty. He may accuse you of mumbling. He may and often does misunderstand the doctor. You will have to explain to him repeatedly as he will also forget what he is told. He may learn to cover up for his failure to hear by nodding, smiling, and pretending. This is quite common. You might ask him to tell you what you said. Above all, be patient.

b. Deafness can be suspected when there is a loss of interest in group activity, in what you say, and in other people; when he attempts to lip read or seems to hear better when he can see your face; and when he apparently ignores orders or suggestions.

c. Remember that communication may be difficult with the aged person even when he can hear —probably 50 years lie between you. You even have different standards; in your world of casual exposure, you may not realize that exposed knees can embarrass an old woman. You think of hospitals as a place where you go to get well; to the old, hospitals are places where you go to die. Be sure that you are really communicating what you want him to know or do.

11-14. Diseases of Old Age

Some of the diseases of old age are shown in table 11-3.

11-15. Needs of Geriatric Patient

The geriatric patient needs all of the following:

- Friends and family
- Maximum self-determination
- Privacy
- Individual expression
- Personal dignity
- New experiences
- Comfort and safety

Most of all, he needs to feel needed.

Table 11-3. Some Diseases and Conditions of Old Age

Disease or condition	What it does and what specialist may notice	Suggestions to specialist
Arteriosclerosis (hardening of the arteries).	Interferes with sight, speech, and circulation of the aged. Causes forgetfulness, particularly of recent events; changes in personality.	Be sure to repeat instructions many times in a slow, calm, deliberate manner. Patient who "runs away" may have just gone for a walk and forgot where to go. Be patient, and do not scold.
Eyes-Cataracts	Results in dimming of vision, progressing into blindness. Has difficulty in reading small print.	Have a stronger light for reading. Give large print for reading matter. Report any complaint referable to eyes to the nurse such as spots before eyes, burning sensation, tearing. If patient has surgery, be alert for unusual reaction to sedative. If eyes are bandaged, always announce your presence.
Ears-deafness	Makes communication difficult and may cause the patient to withdraw.	Speak slowly and deliberately.
Osteoarthritis	Causes pain on motion and swelling of the joints. Patient is afraid to move.	TCL is essential—but do not encourage self-pity. Change position frequently, if bedfast. Encourage movement of all joints.
Fractures	Causes immobility of patient. May mean loss of independence, invalidism, or death to the patient.	Encourage patient to do as much for self as possible. Ambulate as soon as doctor permits. Change position frequently. If casted, watch for development of pressure points. Report to nurse or doctor any swelling, cyanosis, or blanching of skin.
Skin—Loss of sensation	Causes patient to tolerate pressure that would cause younger persons to turn to relieve pressure. Skin may turn red.	Report any redness of skin to doctor or nurse. See that the patient turns frequently. Massage only on doctor's orders. It is dangerous to massage extremities, particularly if patient complains of pain, because it might result in an embolus.
—Pruritis	Results from loss of oil. Causes intense itching. Results in excoriation of skin.	Use lanolin-rich lotion; bathe less frequently.
Arteriosclerotic heart disease.	Causes multiple small clots, which interfere with circulation to the heart muscle. Symptoms of cardiac failure, such as shortness of breath, fatigue, dependent edema.	Use slow motions. Allow patient to rest the moment he feels tired. Patient may breathe or sleep better when head is elevated.
Peripheral vascular disease	Decreases circulation to extremities because the circulatory system breaks down. Patient may complain of cold feet, numbness, tingling, or loss of feeling.	Use loose fitting socks or booties in bed. Use patient's shoes or slippers with firm soles if out of bed. Keep feet clean; soak as a part of bath.
Cerebrovascular Accidents (CVA).	Results in strange behavior, dizzy spells, forgetfulness, and confusion. Aphasia (loss of speech) and paralysis may occur.	Encourage patient to do as much as possible for self. If aphasic, talk to patient, not about him; he may understand more than he shows. Have patient use pencil and paper as a means of communication if possible. Protect against injury; *for example*, support in wheel chair and use bed side rails.
Cancer	Can result in mutilating surgery. May be cured. Often seen as a terminal case. Because of this, the word can cause extreme fear and anxiety. Patient may be apathetic or extremely anxious.	Attend to patient's physical needs as promptly as possible. Keep as comfortable as possible through nursing measures: turn frequently, give back rubs, and give medication for pain when requested by patient. Listen to patient; you may be his "sounding board." Encourage family to visit frequently.
Diabetics	Causes poor circulation and slow healing of injuries. A small injury to foot may result in amputation.	Encourage him to eat all food on tray, report what is left to nurse. Old people may act like children when confronted with a diet. They may get candy bars or refuse to eat. Foot care is extremely important. Keep extremely clean; give immediate care to any broken area; cut nails and fingernails only on doctor's orders and then very carefully. Check shoes for proper fit; hose or socks must not have mends or ridges.

Disease or condition	What it does and what specialist may notice	Suggestions to specialist
Pneumonia	Often causes light cough, drowsiness, and apathy. Patient may not appear as ill as he is.	Keep patient comfortable, often in a low Fowler's position. Put a pillow against the lower back or elevate the head of the bed on shock blocks. May be more comfortable in a chair but avoid exerting him, as pneumonia places a strain on the heart.
Tuberculosis	Causes cough and sputum. Common among elderly people, especially men. May not look as sick as he really is.	Teach him how to protect others but make allowance for his habits. If he will not use tissues, get soft rags that can be burned. While patient is in the hospital, he should be referred to the Army Health Nurse for contact investigation and for patient and/or family education on tuberculosis. If he is returned home, the Army Health Nurse should continue involvement in the case, checking him and his family by periodic contact followup and public health supervision of patient and family in the home.

11-16. Special Precautions

- Be especially alert to any confusion following sedation. Old people often have adverse reactions to sedatives and to medications given for pain.
- If a heating pad or hot water bottle is ordered by the physician, check frequently for condition of skin. Older people have a tendency to poor circulation and decreased sensation in their extremities. The patient may not realize the heating pad is too hot until he is burned.
- If postural drainage is necessary, try merely elevating the foot of the bed first as this may be enough, or put the patient's head at the foot of bed, placing the side with the affected lung uppermost and raising the knee gatch. He must be watched closely as he may not be able to tolerate it. Unless specifically ordered, the elderly patient is never placed crosswise on the bed with his head resting on the floor.
- If oxygen is ordered, give the geriatric patient special assurance. He may think this is a last resort and that he is dying.
- Insure that aged patients get frequent periods of exercise alternating with frequent periods of rest.
- Insure that he has proper ventilation. This is essential, since the decreased chest expansion and impaired circulation decrease the oxygen supply to the tissues. Do not put a geriatric patient in a draft, however.

11-17. Role of the Army Health Nurse in Geriatric Care

Because the older patient's illness may be a long one, with alternating periods of hospitalization and home care; because he may be alone and need special guidance; because of the need for special instructions to his family, the Army Health Nurse is usually consulted in health problems involving geriatrics. The time of her involvement will be decided by the doctor or nurse, but it will probably be *before the patient returns home.* The specialist should furnish her with any information requested. DA Form 8-264 (Army Health Nursing Program—Case Referral) should be used.

APPENDIX A

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AR 40–2	Army Medical Treatment Facilities—General Administration
AR 40–3	Medical, Dental, and Veterinary Care
AR 40–4	Army Medical Department Facilities
AR 40–6	Army Nurse Corps
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AR 40–407	Nursing Book Unit and Nursing Records
AR 40–419	Outpatient Report
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TM 8–225	Dental Specialists
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TM 8–260	Pharmacy Specialist
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APPENDIX B

MOVEMENT TERMINOLOGY

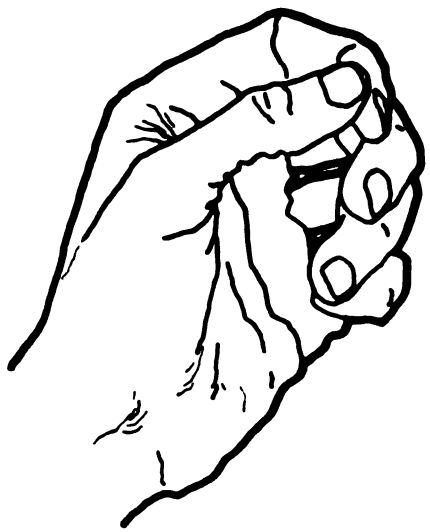
B-1. Motions of Joints

a. Joints of the body are capable of various motions according to the structures involved. Generally, when the joint angle becomes smaller than when in the anatomical position, it is in flexion. For example, when the elbow is bent, it is flexed. The opposite of flexion is extension. Thus, when the elbow is straight, it is extended. When a part is farther away from the midline than it is in the anatomical position, it is in abduction. *For example,* when the arm is raised out to the side, it is abducted. The opposite of abduction is adduction. A combination of these four motions—flexion, extension, abduction, and adduction—is called circumduction.

b. If a bone of a joint is capable of turning on its own long axis, the motion is called rotation. The motion of turning in toward the midline of the body is called inward or internal rotation, and the motion of turning out is called outward or external rotation. (The humerus in the anatomical position is in external rotation.) These basic motions of the body are illustrated in figures B-1 through B-11.

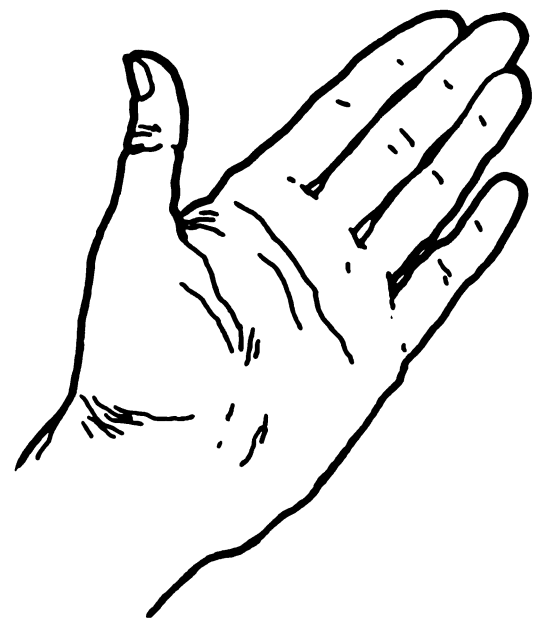
B-2. Anatomical Terminology

Paragraph 2-8 covers other terms used in anatomical terminology; paragraphs 2-19 and 2-20 cover other information on movements.



(1) FLEXION

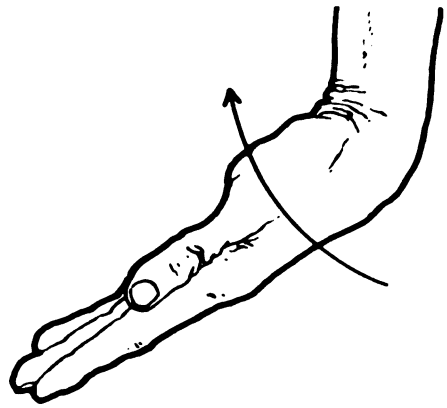
FINGERS BEND FORWARD AT METACARPOPHALANGEAL JOINTS AND AT INTERPHALANGEAL JOINTS



(2) EXTENSION

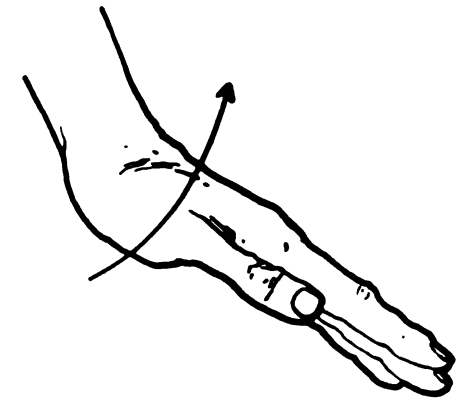
FINGERS RETURN TO STRAIGHTENED POSITION

Figure B-1. Finger motion.



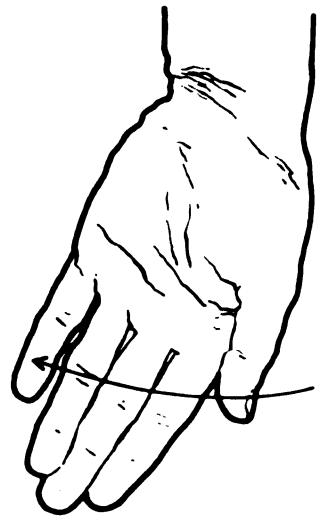
(1) FLEXION

HAND MOVES FORWARD.



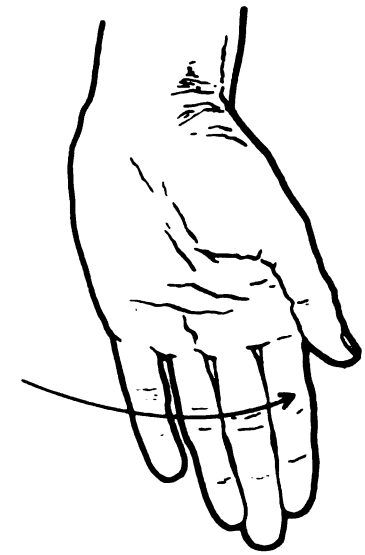
(2) EXTENSION

HAND MOVES BACKWARD.



(3) ULNAR DEVIATION

(ADDUCTION)
HAND MOVES TOWARD LITTLE FINGER SIDE.



(4) RADIAL DEVIATION

(ABDUCTION)
HAND MOVES TOWARD THUMB SIDE

CIRCUMDUCTION
(A CIRCULAR MOVEMENT – A COMBINATION OF THE ABOVE.)

Figure B-2. Wrist motion.

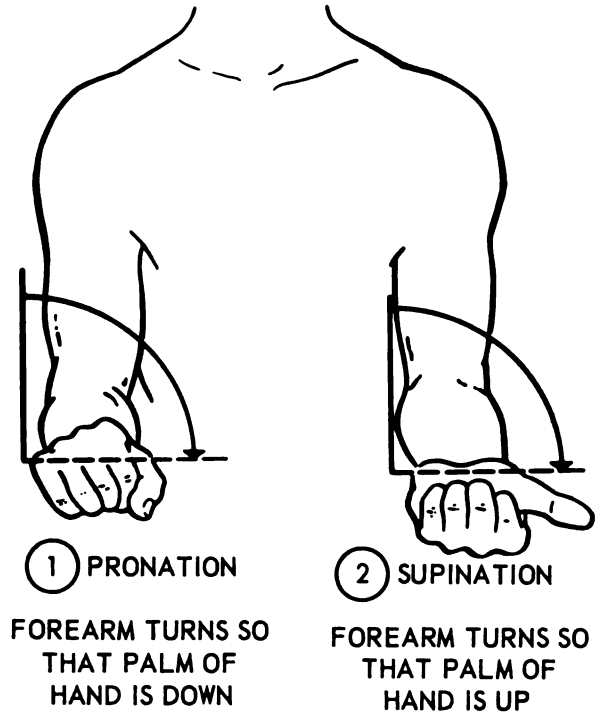


Figure B–3. Radio-ulnar motion.

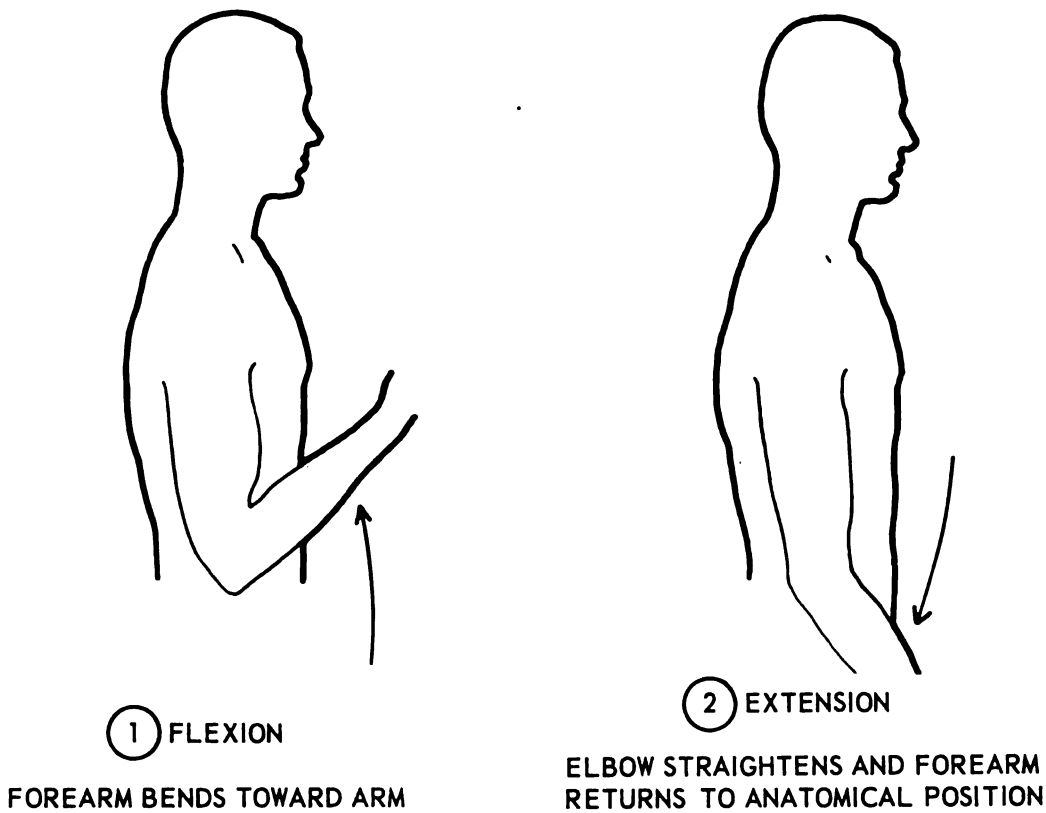


Figure B–4. Elbow motion.

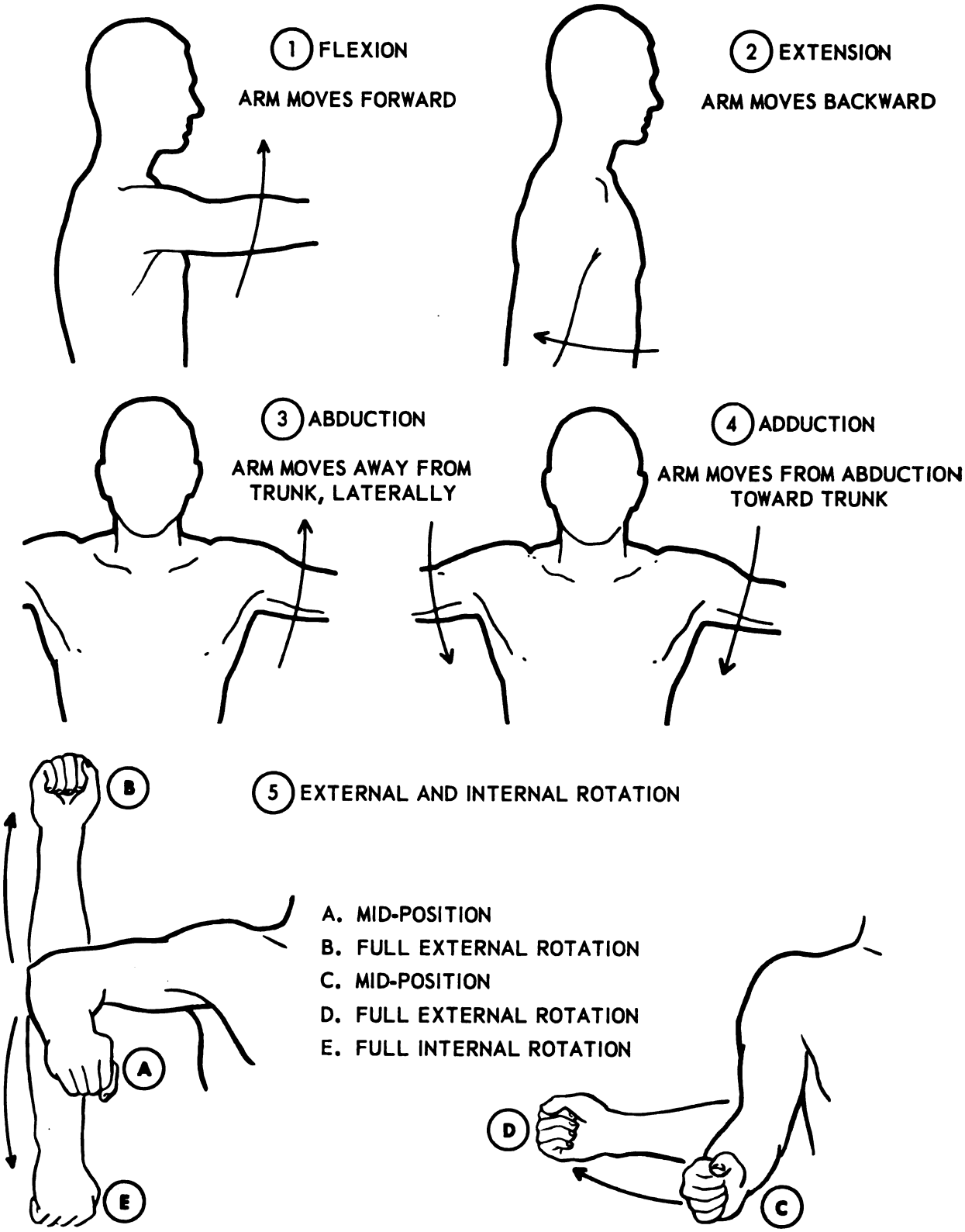
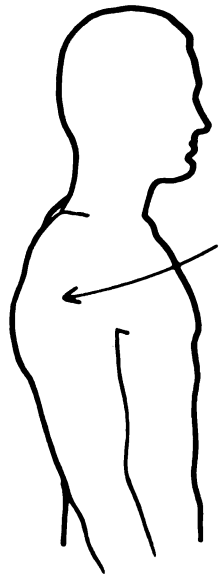
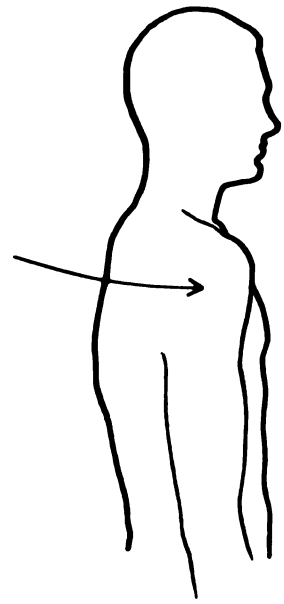


Figure B-5. Shoulder motion.



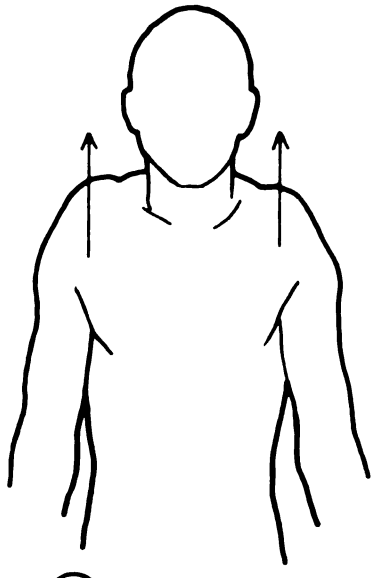
(1) ADDUCTION

(SCAPULAE MOVE TOWARD VERTEBRAL COLUMN.)



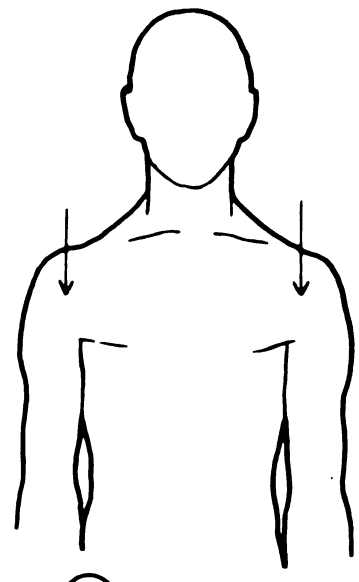
(2) ABDUCTION

(SCAPULAE MOVE AWAY FROM VERTEBRAL COLUMN.)



(3) ELEVATION

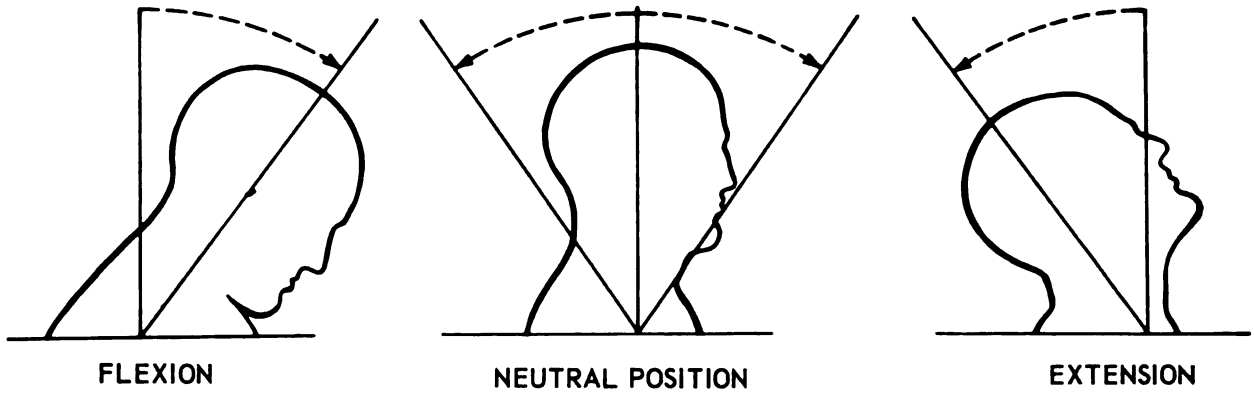
(SCAPULAE AND CLAVICLES MOVE UPWARD.)



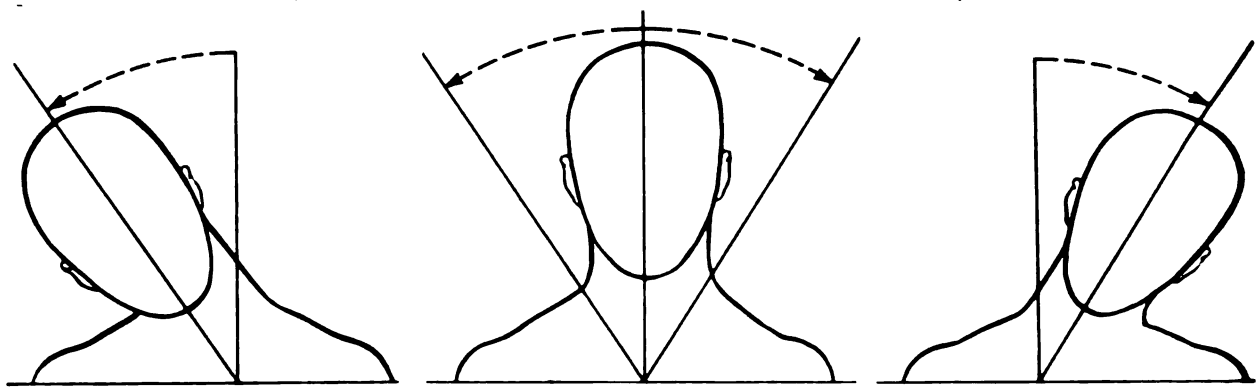
(4) DEPRESSION

(SCAPULAE AND CLAVICLES MOVE DOWNWARD.)

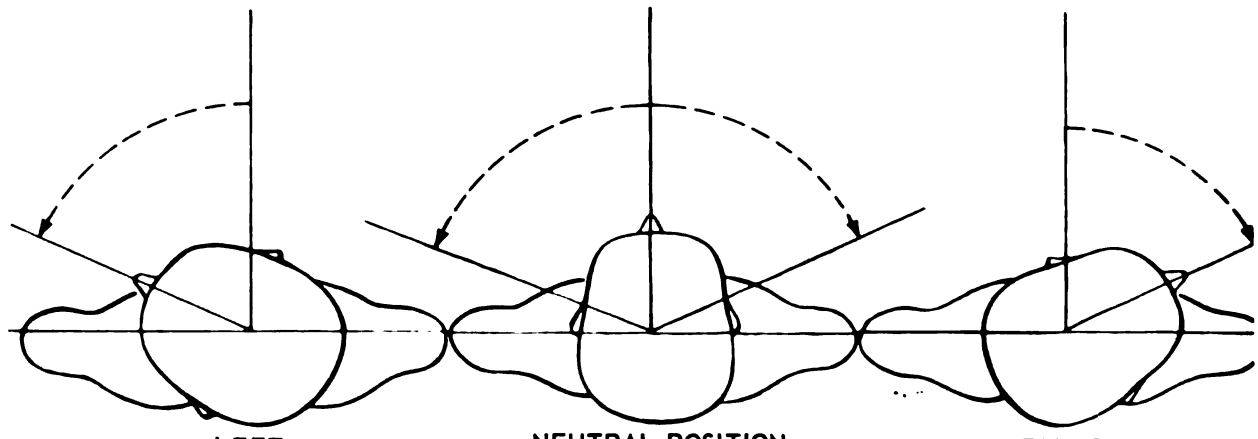
Figure B–6. Shoulder girdle motion.



A. FLEXION AND EXTENSION
(OCCURS CHIEFLY IN THE LOWER CERVICAL AREA.)



B. LATERAL FLEXION
(OCCURS IN THE MIDCERVICAL AREA.)



C. ROTATION
(OCCURS BETWEEN THE FIRST AND SECOND CERVICAL VERTEBRAE.)
HEAD TURNS TO RIGHT OR LEFT ACCOMPANIED BY SMALL
AMOUNT OF LATERAL FLEXION TO SAME SIDE

Figure B-7. Head and neck motion.

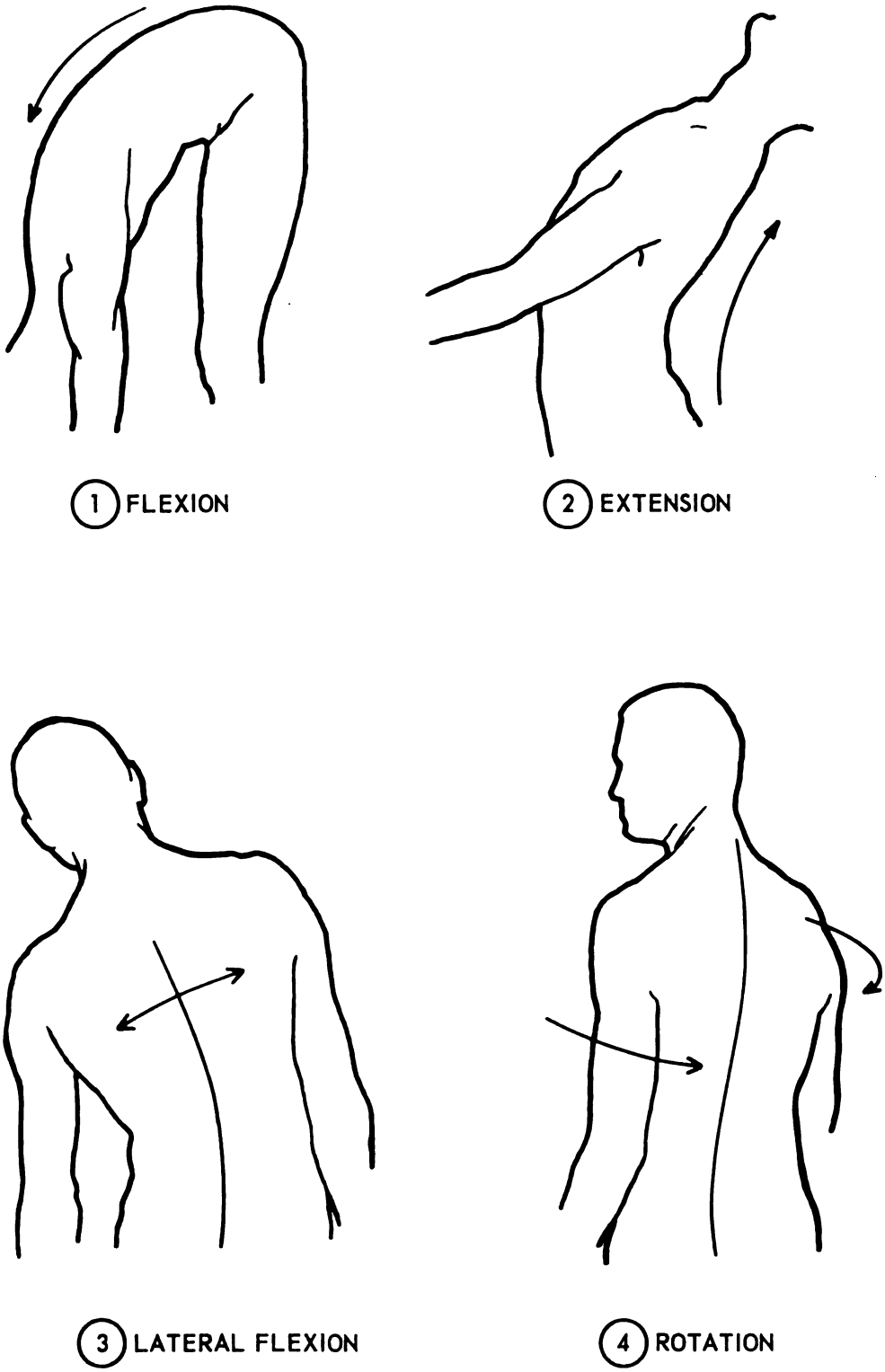
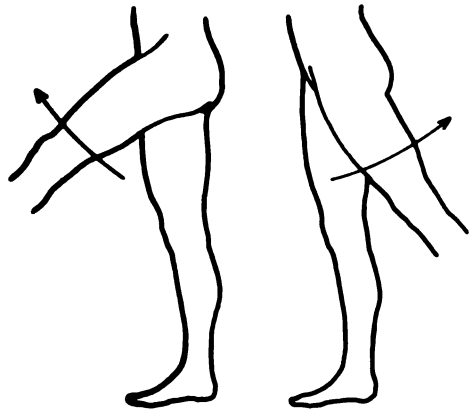


Figure B–8. Trunk motion.

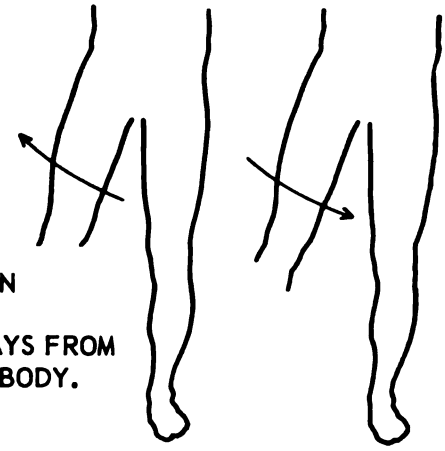


(2) EXTENSION

THIGH MOVES BACKWARD.

(1) FLEXION

THIGH MOVES FORWARD.

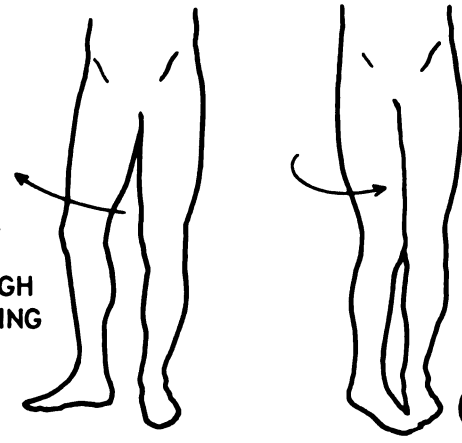


(3) ABDUCTION

THIGH MOVES SIDEWAYS FROM CENTER LINE OF BODY.

(4) ADDUCTION

THIGH MOVES FROM POSITION OF ABDUCTION TOWARD CENTER LINE OF BODY.



(5) EXTERNAL ROTATION

ANTERIOR SURFACE OF THIGH TURNS LATERALLY, ROTATING THE THIGH OUTWARD.

(6) INTERNAL ROTATION

ANTERIOR SURFACE OF THIGH TURNS MEDIALLY, ROTATING THE THIGH INWARD.

(CIRCUMDUCTION, A CIRCULAR MOVEMENT, IS A COMBINATION OF FLEXION, EXTENSION, ABDUCTION, AND ADDUCTION.)

Figure B–9. Hip motion.

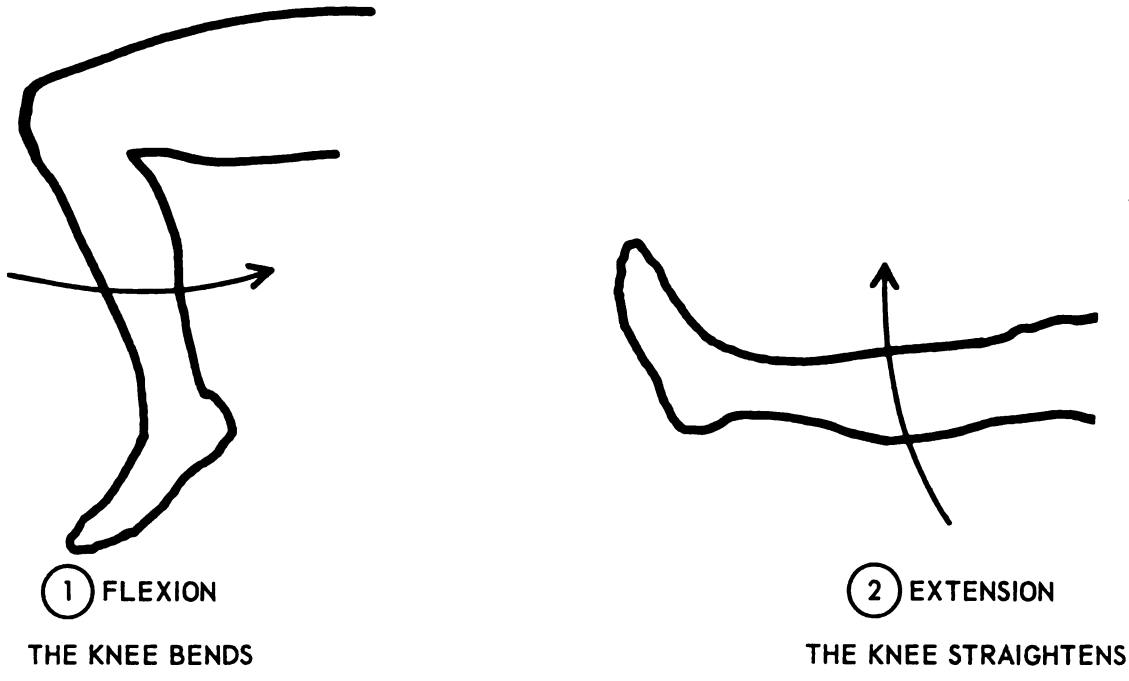


Figure B–10. Knee motion.

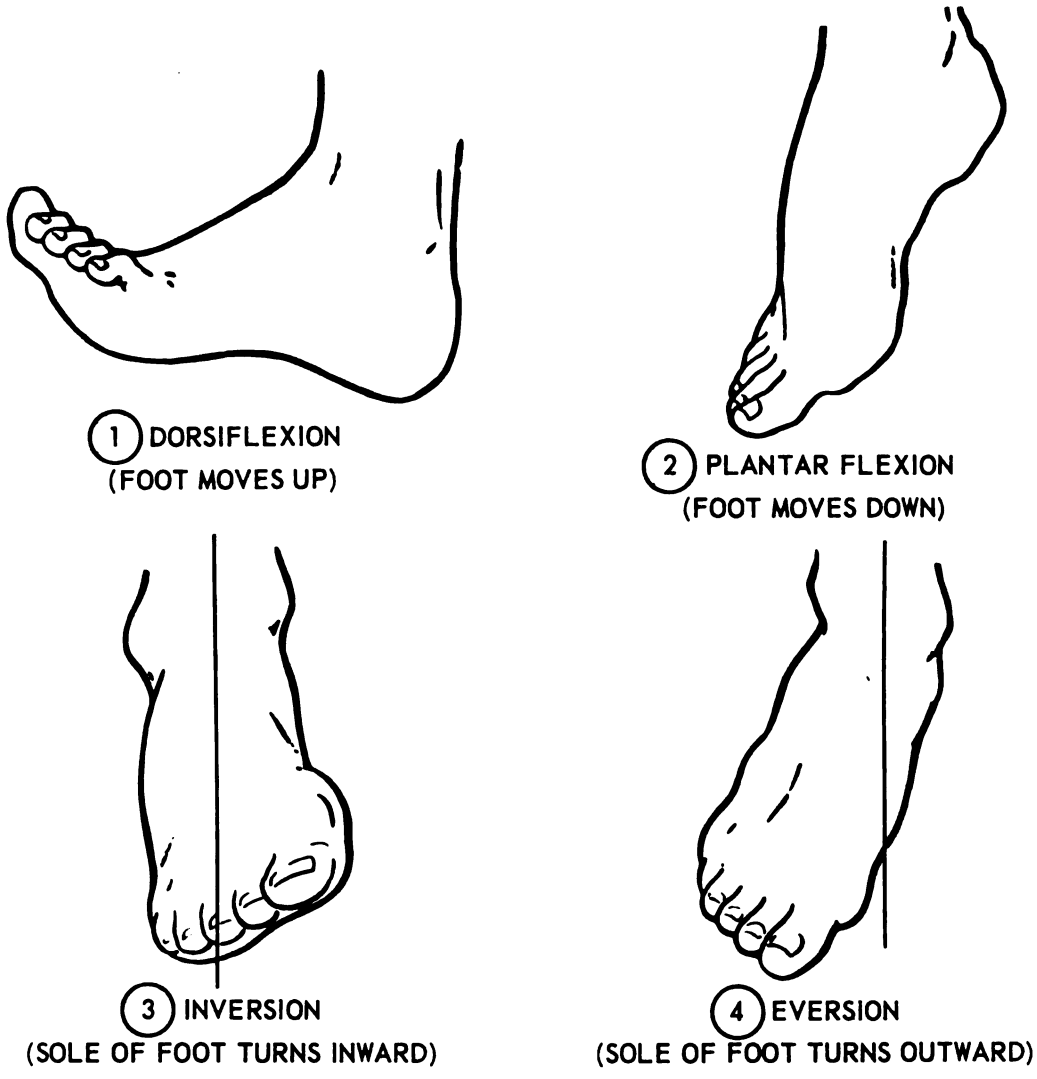


Figure B–11. Ankle and foot motion.

APPENDIX C

PREOPERATIVE ANATOMICAL PREPPING CHARTS AND GENERAL INFORMATION

C-1. General Information

The specialist's responsibility in preoperative preparation of the skin involves procedures which are considered routine. These procedures will vary slightly for different operations. This is presented as a means of demonstrating the areas of the skin that should be prepared for surgery (figs. C-1 through C-21*).

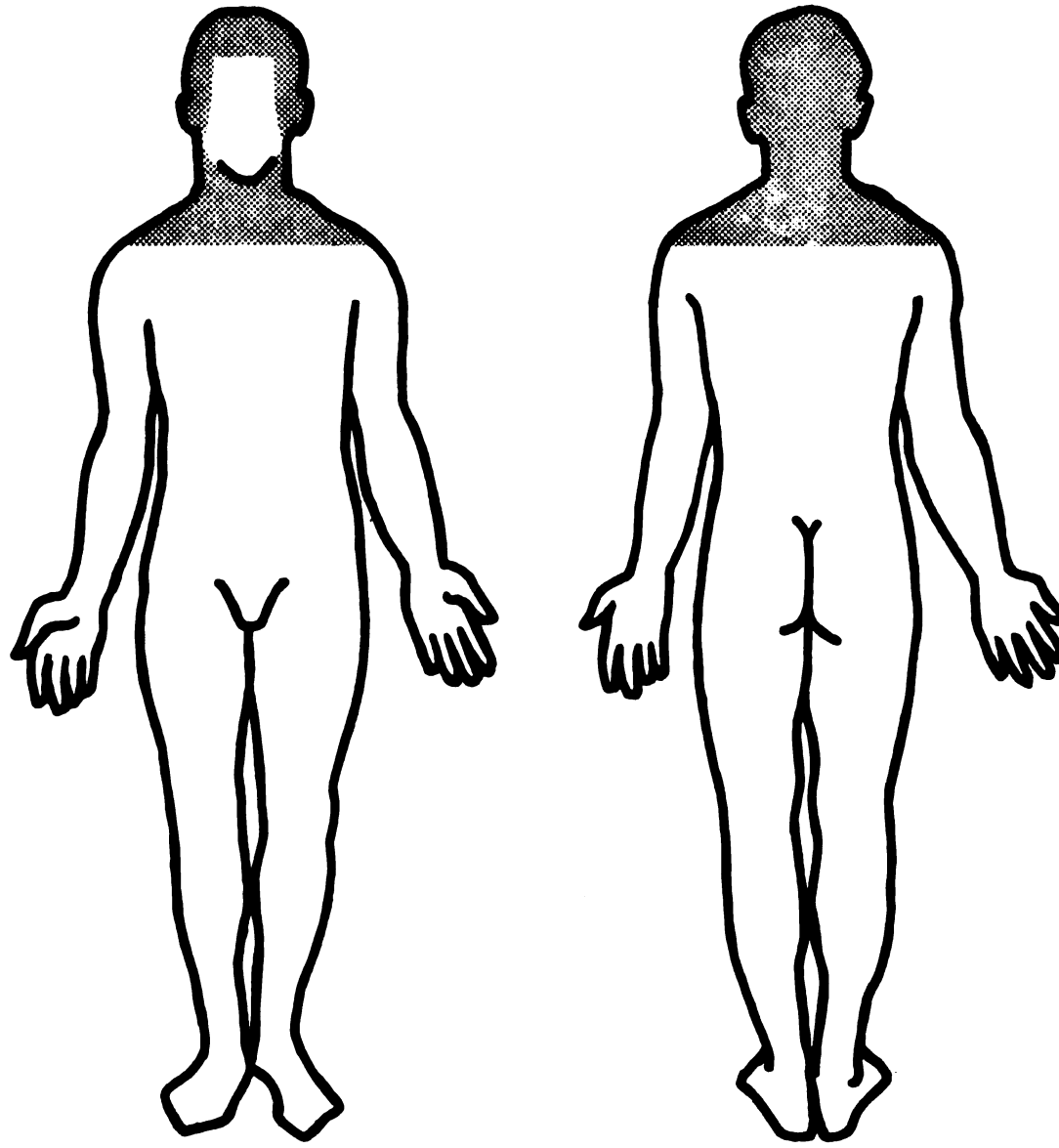
C-2. Basic Information for the Specialist

Prior to preparing the skin for surgery—

1. The specialist should examine the area for any unusual manifestations. If any unusual conditions are present, this should be reported to the nurse or physician.
2. The patient must be comfortable, reassured, and privacy provided.
3. Skin preparation should be done as close to the scheduled time of surgery as possible in order to minimize the regrowth of bacteria or hair. For some surgical procedures it may be necessary to prepare the skin after the patient has been anesthesized.

In any case, the patient must be completely prepared for surgery when the surgeon is ready to start the procedure.

* The charts in subject figures are supplied through the permission of The Purdue Frederick Company.



Clean the external ear canal with a cotton swab and insert a cotton plug to prevent drainage into the ear. The prepared area extends from the brow line over the head including the ear and the anterior and posterior neck regions to the clavicular level. Facial area is excluded.

Figure C-1. Preparation for head surgery.
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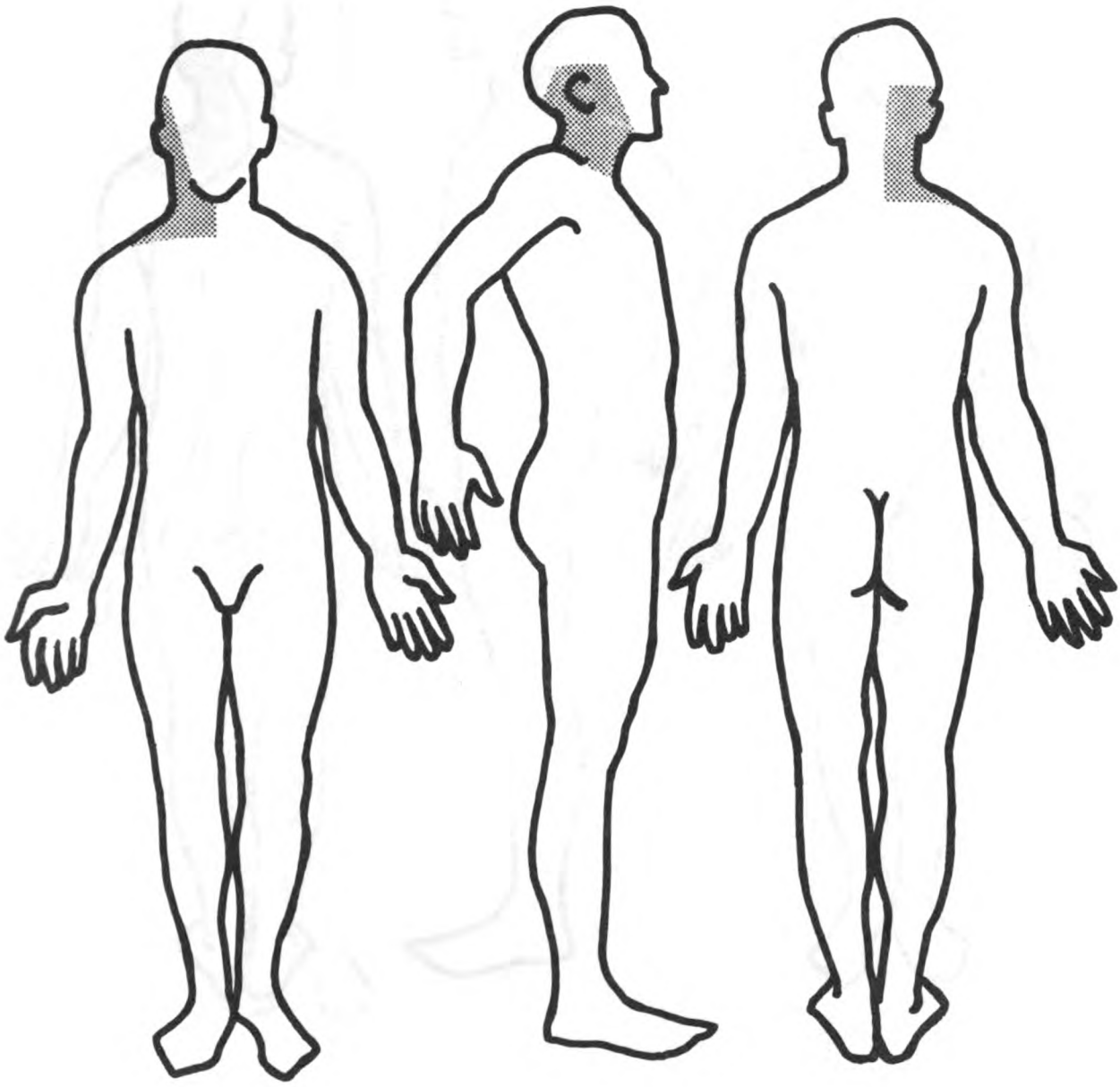

In unilateral operations, clean the affected ear. The prepared area extends from just above the ear to the level of the clavicle. Laterally it extends approximately one third of the way around the neck both anteriorly and posteriorly.

Figure C–2. Preparation for ear surgery.
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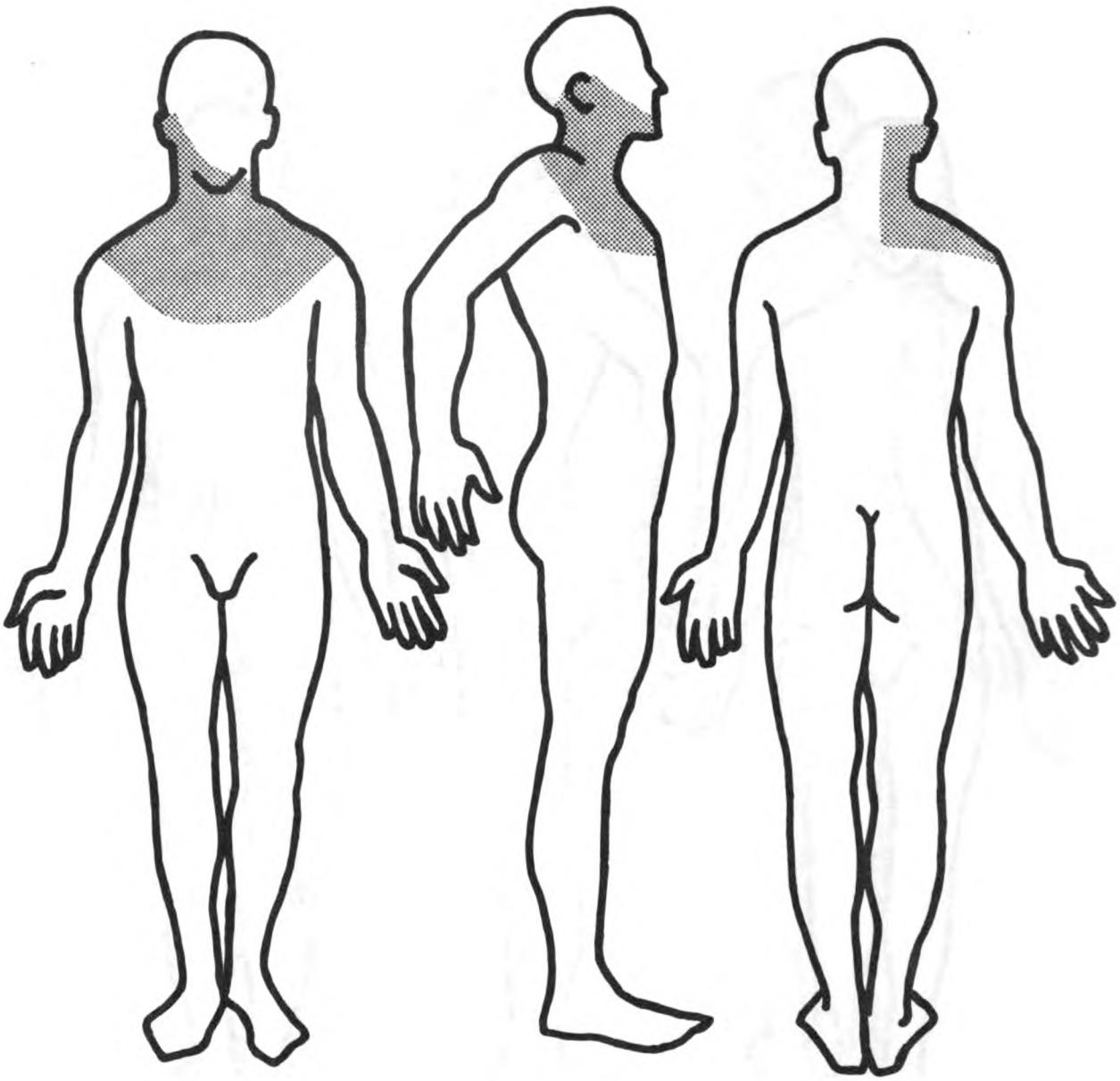

EAR

Clean the external canal with a cotton swab.

NECK AND CHIN

The prepared area covers the side of the face, from above the ear and includes the chin, the anterior surface of the neck and the upper thorax to a level just below the clavicle.

Posteriorly it extends around the neck to the spine and includes the area above the scapula.

Figure C–3. Preparation for submaxillary or neck surgery.
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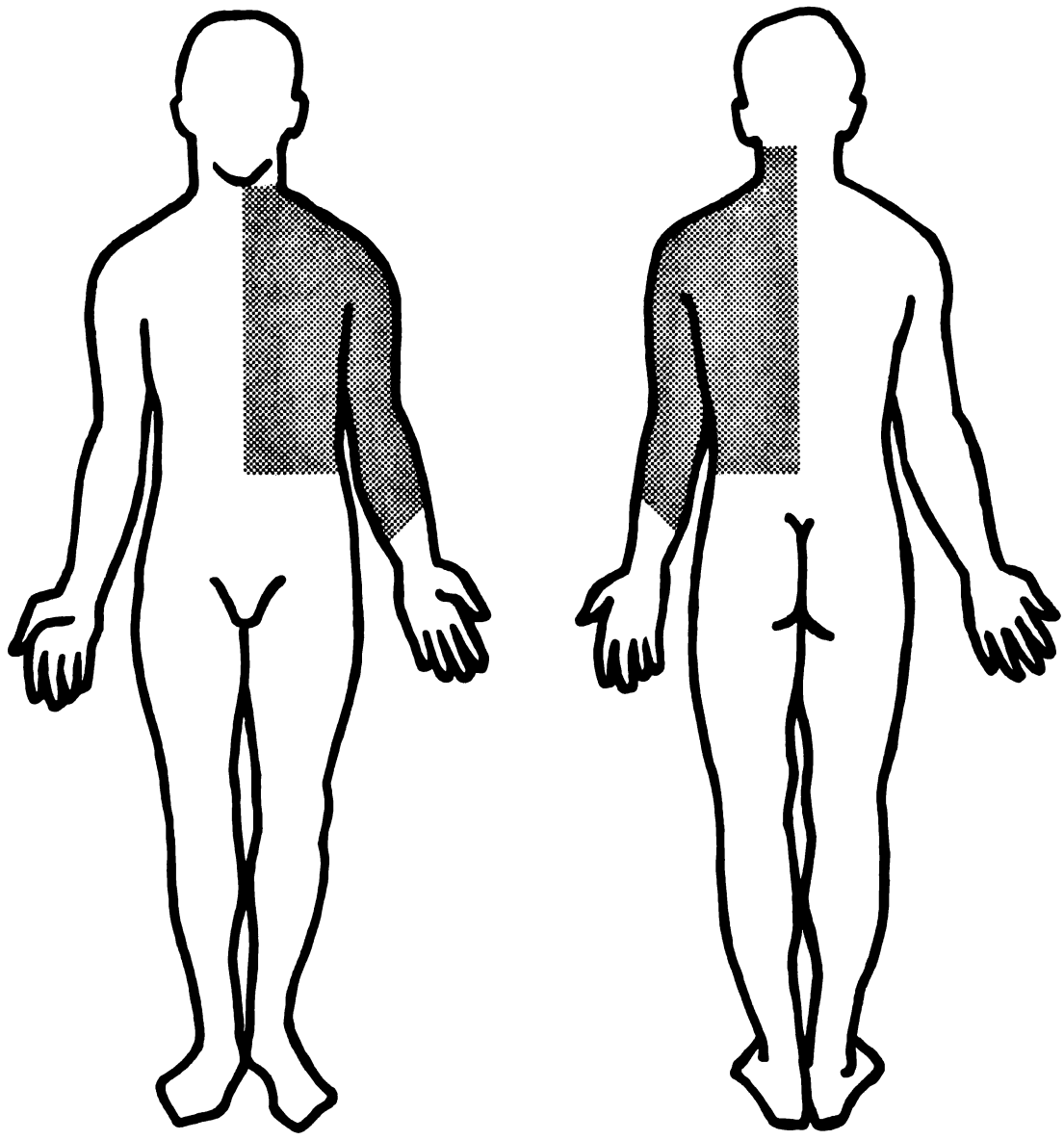

The prepared area extends from the neck to the lower level of the thoracic cage and to the midline both anteriorly and posteriorly.

The affected shoulder, axilla and circumference of the arm to the mid forearm are included.

Figure C–4. Preparation for shoulder and upper extremity surgery.
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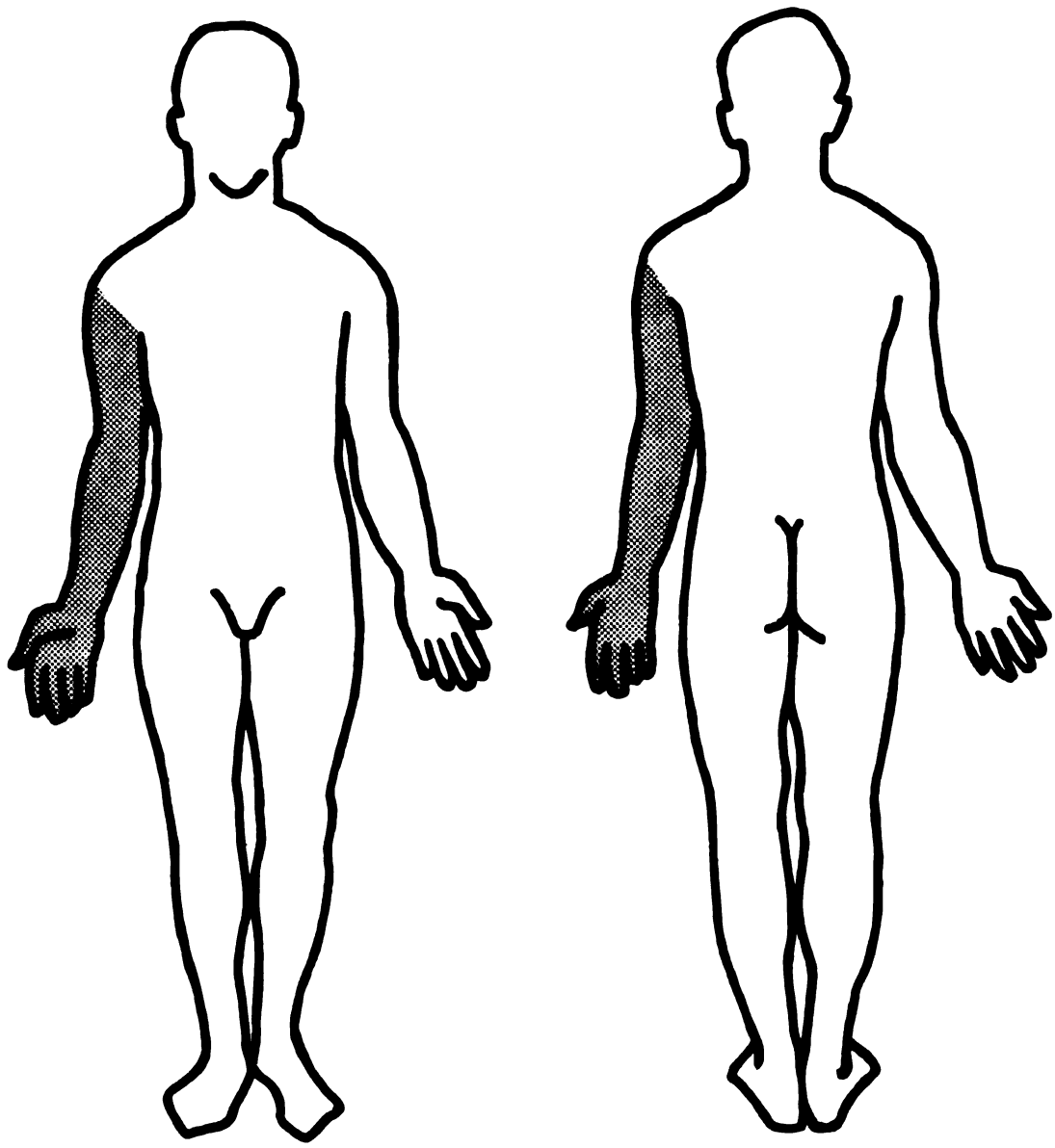

The prepared area should include the full circumference of the arm from the axilla to the fingertips.

Figure C-5. Preparation for forearm, elbow, or hand surgery.
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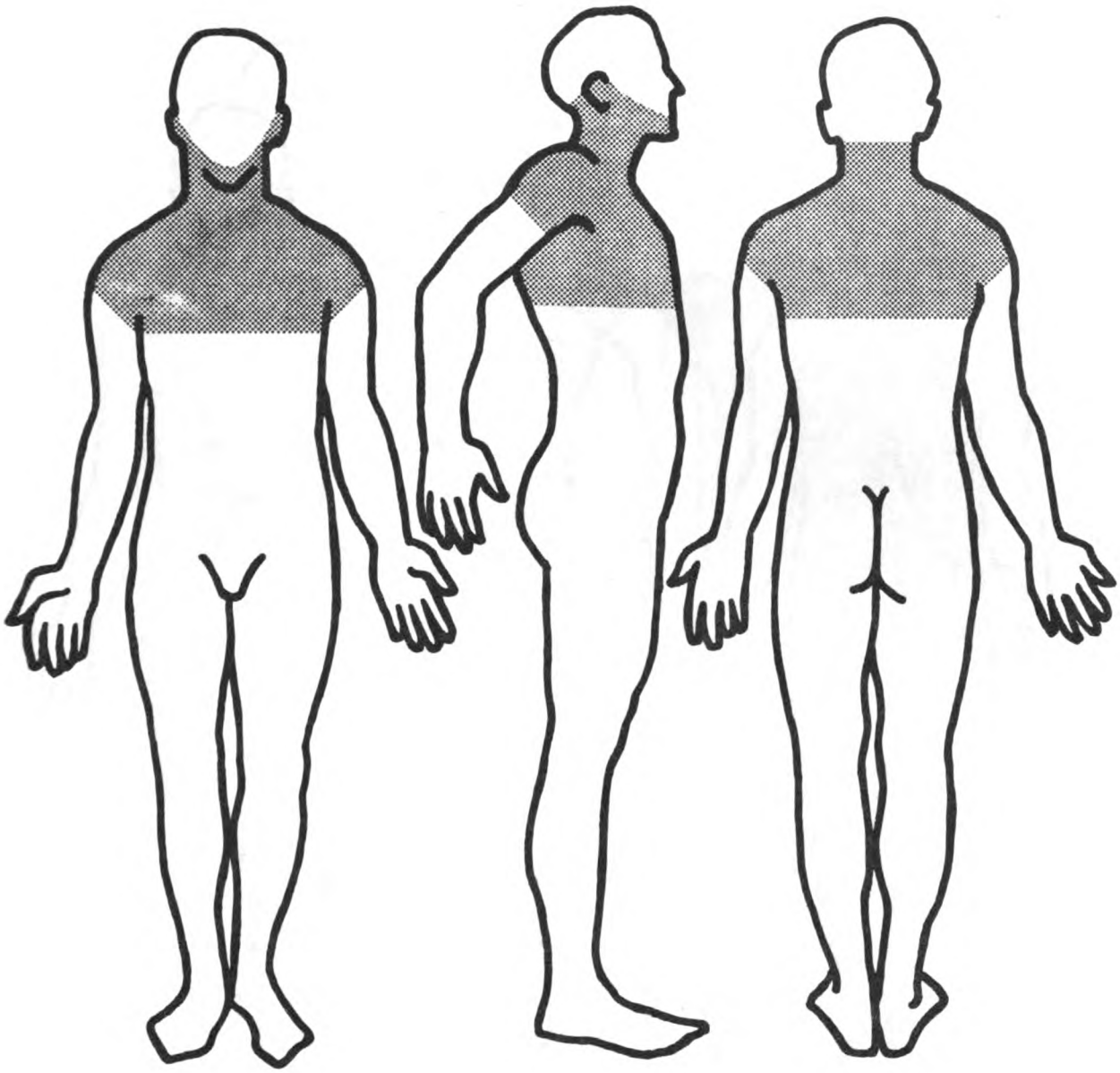

Anteriorly the prepared area begins at the earline, includes the chin, and extends to the level of the nipples.

Posteriorly it extends from the hairline to the lower level of the scapula.

Both shoulders and axillae are included.

Figure C–6. Preparation for upper thoracic surgery.
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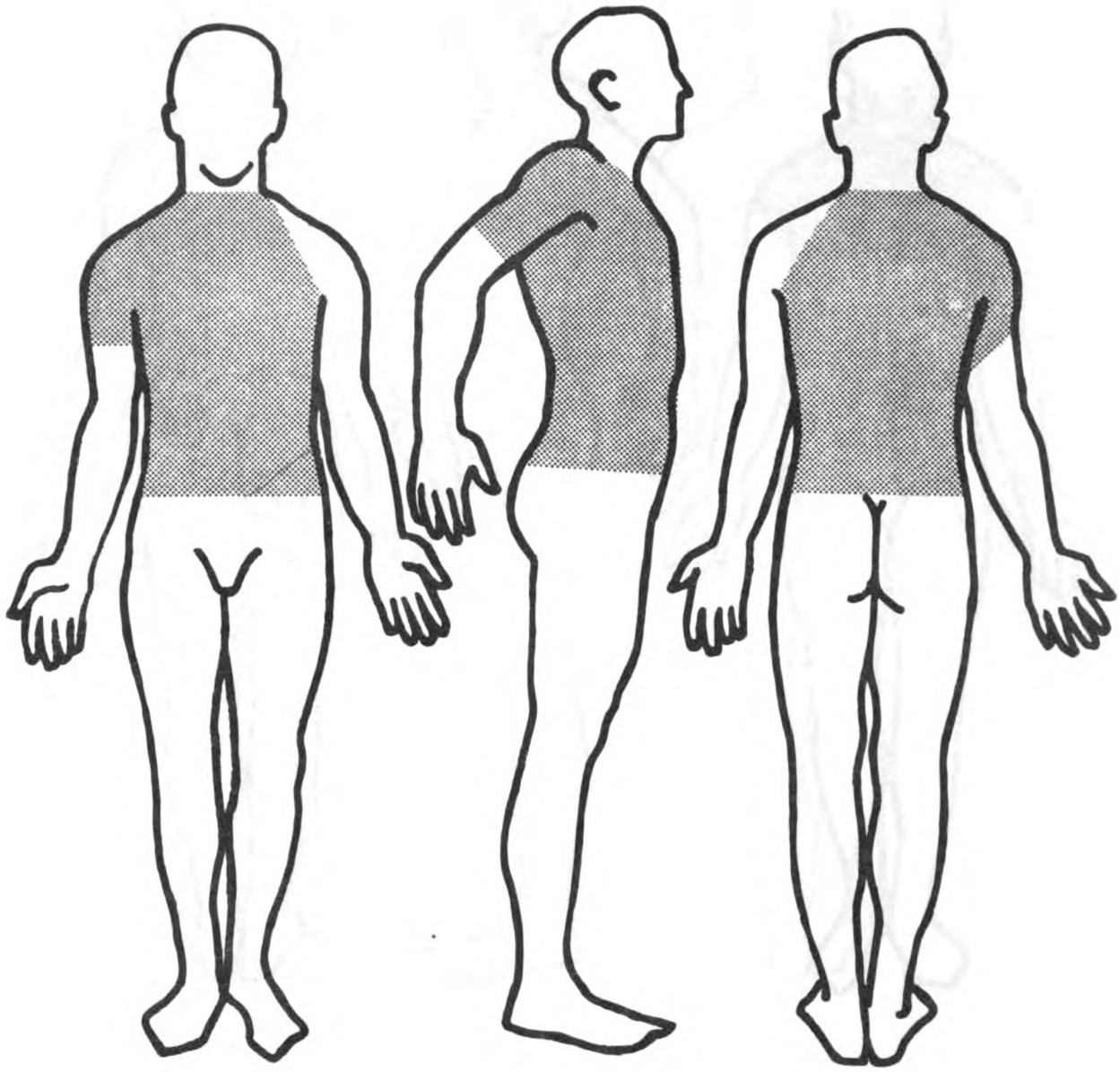

The prepared area extends anteriorly from the lower neck line to just above the pubis. Posteriorly it extends from the lower neck line to the coccyx. The affected shoulder and uppermost part of the same arm are included and laterally it covers the circumference of the torso.

Figure C–7. Preparation for chest-unilateral surgery.
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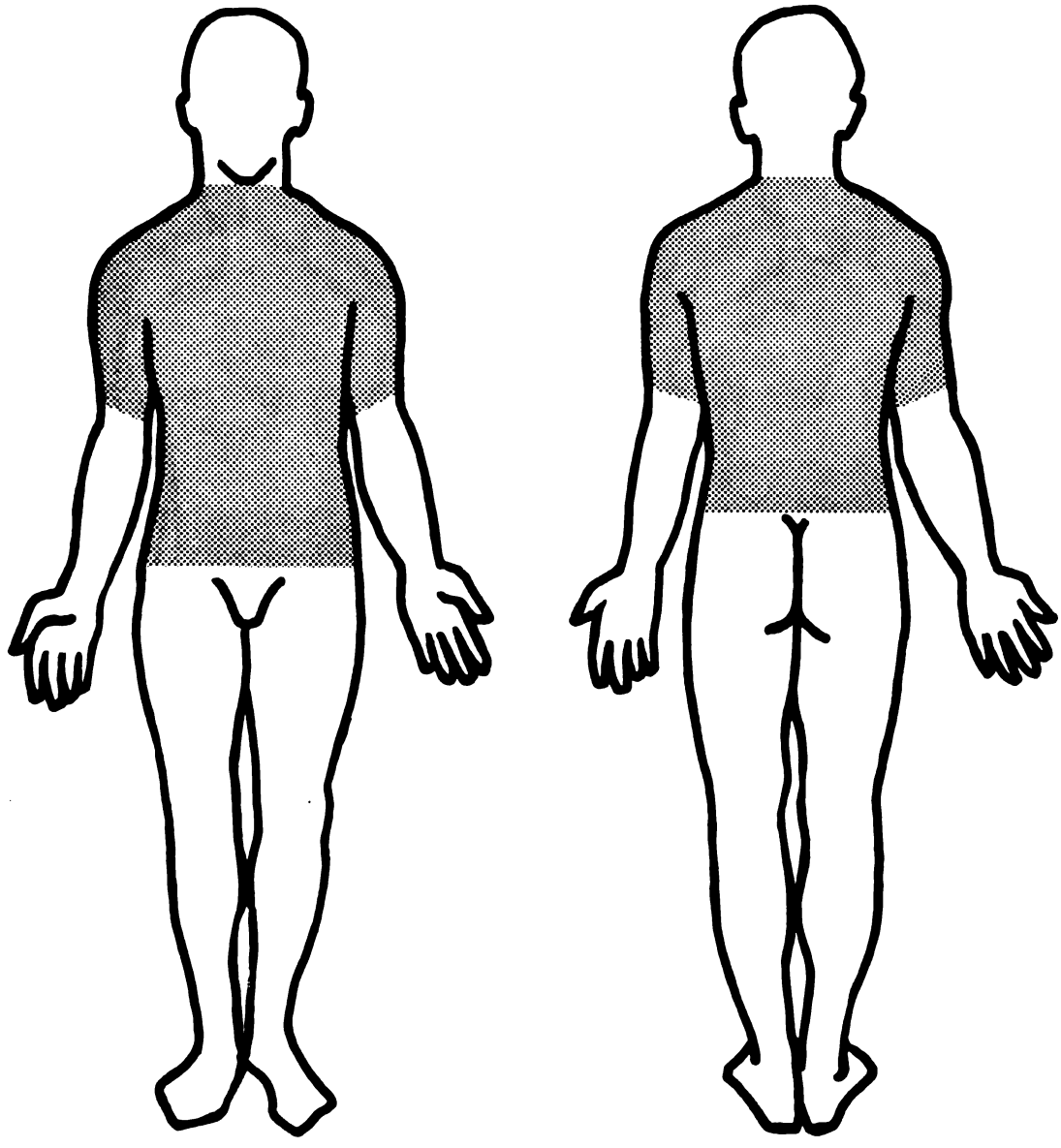

The prepared area covers the back, front and sides of the chest and abdomen. In the front, it extends from the neck to just above the pubic symphisis. In the back, it extends from the neck to just above the gluteal fold. Arms are included almost to the elbow.

Figure C–8. Preparation for thoraco-abdominal surgery.
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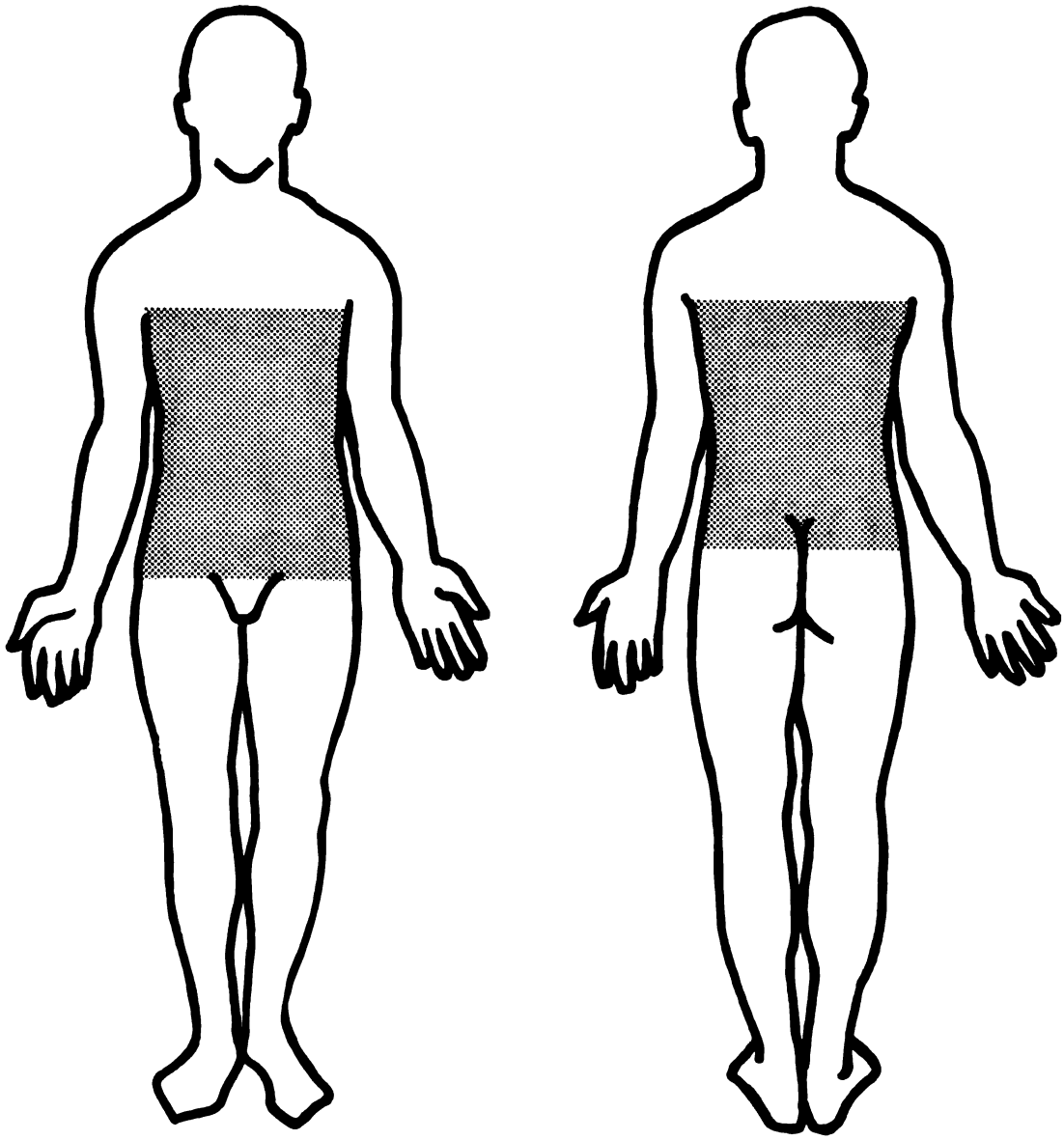

The prepared area extends anteriorly from the axillae to the pubis. Posteriorly it extends from the mid scapula to the mid gluteal regions. Laterally it covers the circumference of the torso.

Figure C-9. Preparation for renal and upper ureteral surgery.
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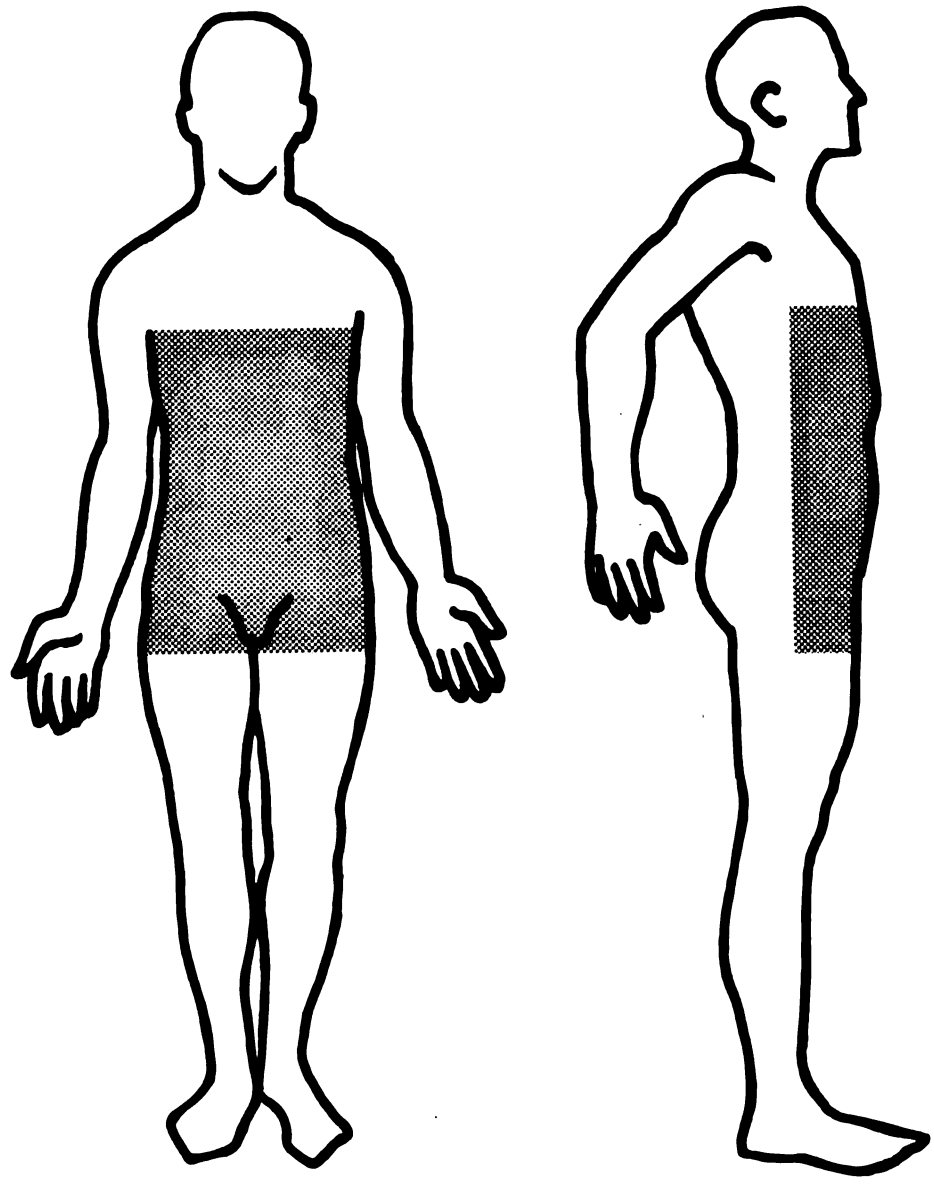

The prepared area extends from the level of the nipple to the upper thighs including the external genitalia. Laterally it extends around the body to the bedline on either side.

Figure C-10. Preparation for abdominal surgery.
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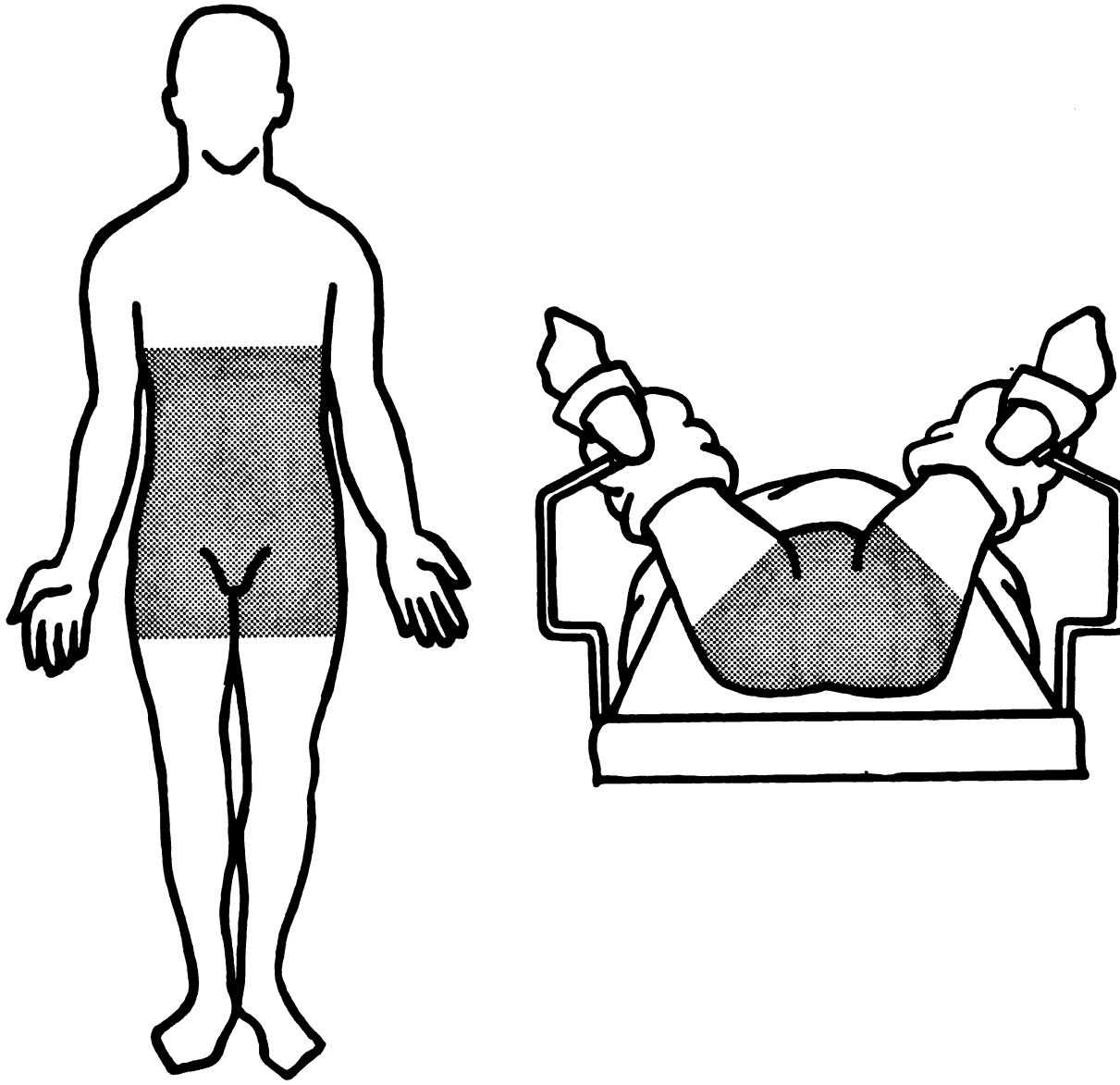
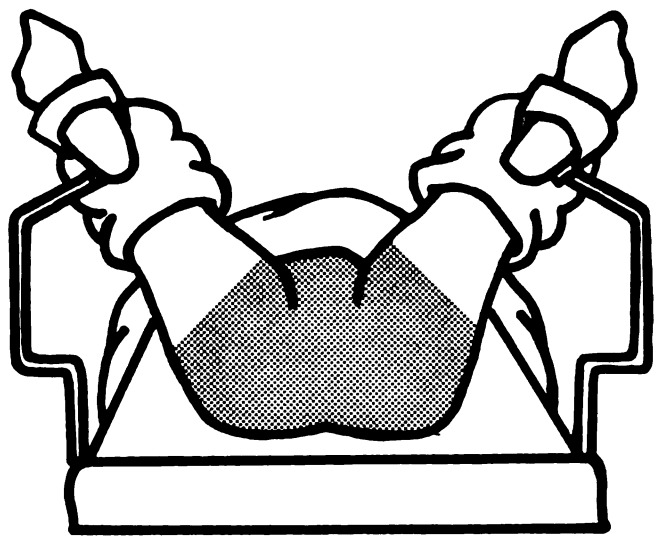


The prepared area extends from the level of the nipples to the upper level of the thighs. Laterally, it extends around the curvature of the body to the bedline. The external genitalia and perineal region are included.

Figure C-11. Preparation for gynecological and genito-urinary surgery. (Copyright, The Purdue Frederick Company)



The prepared area covers the perineal region. Anteriorly it extends from a point just above the pubis and posteriorly to a point just beyond the anal region. The inner part of both thighs are included.

Figure C–12. Preparation for minor vaginal surgery.
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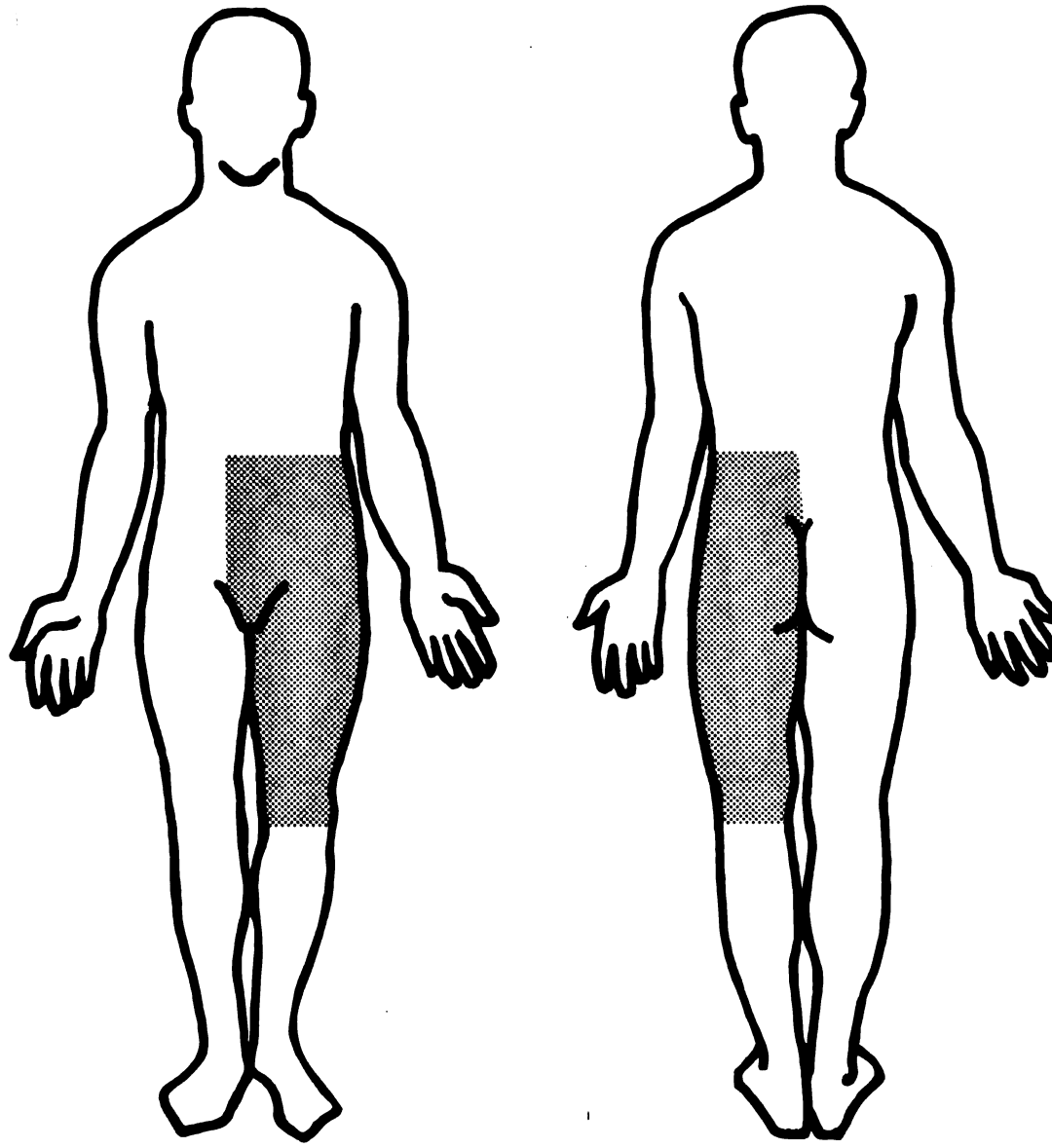

The prepared area extends from a level just below the umbilicus, covering the affected side of the abdomen, hip and buttock and the circumference of the lower extremity to below the knee.

Figure C–13. Preparation for unilateral hip surgery.
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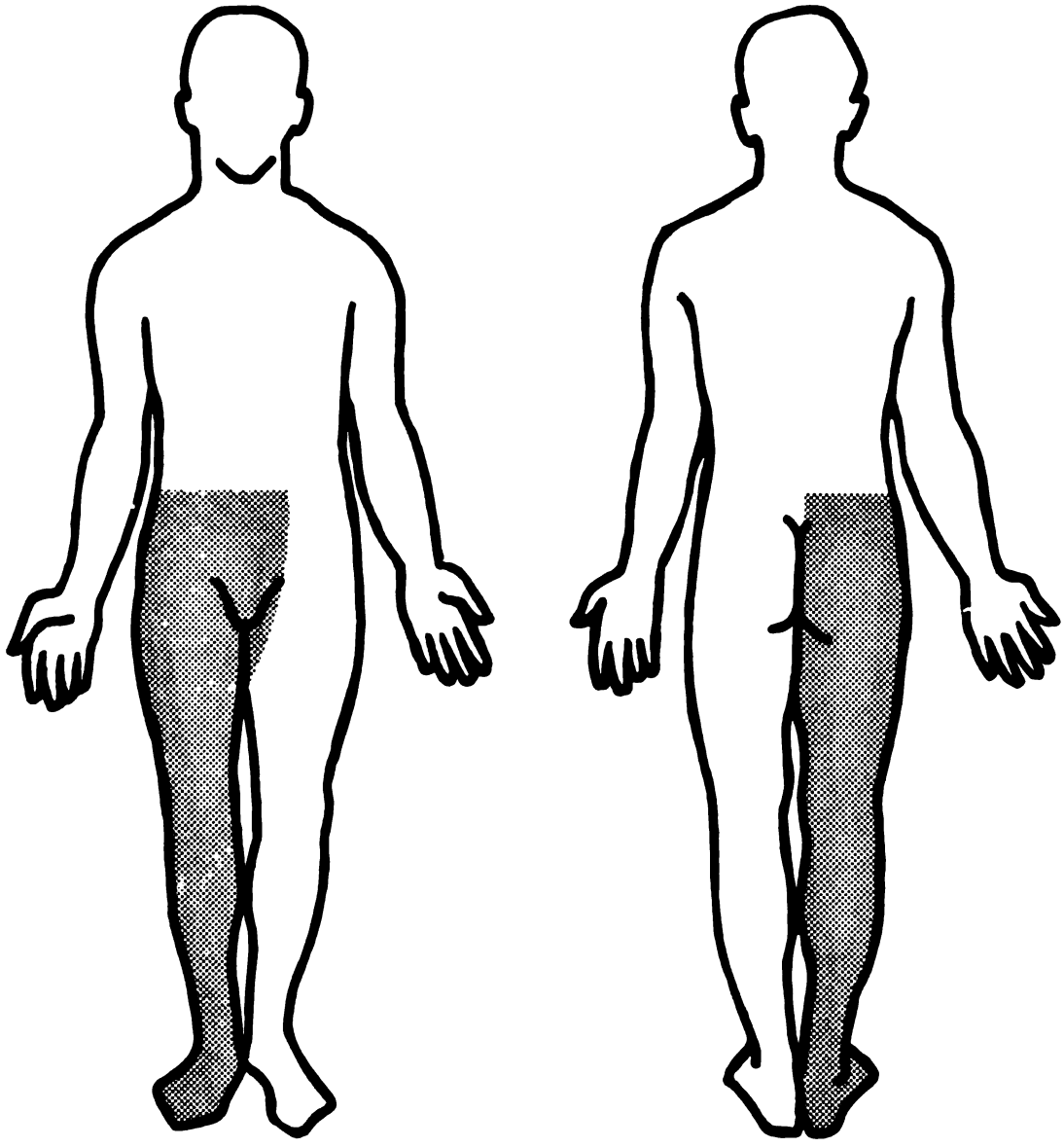

The prepared area extends from a level just below the umbilicus, covering the affected side of the abdomen, hip and buttock and the circumference of the entire lower extremity. The external genitalia should be included.

Figure C-14. Preparation for unilateral thigh and leg surgery.
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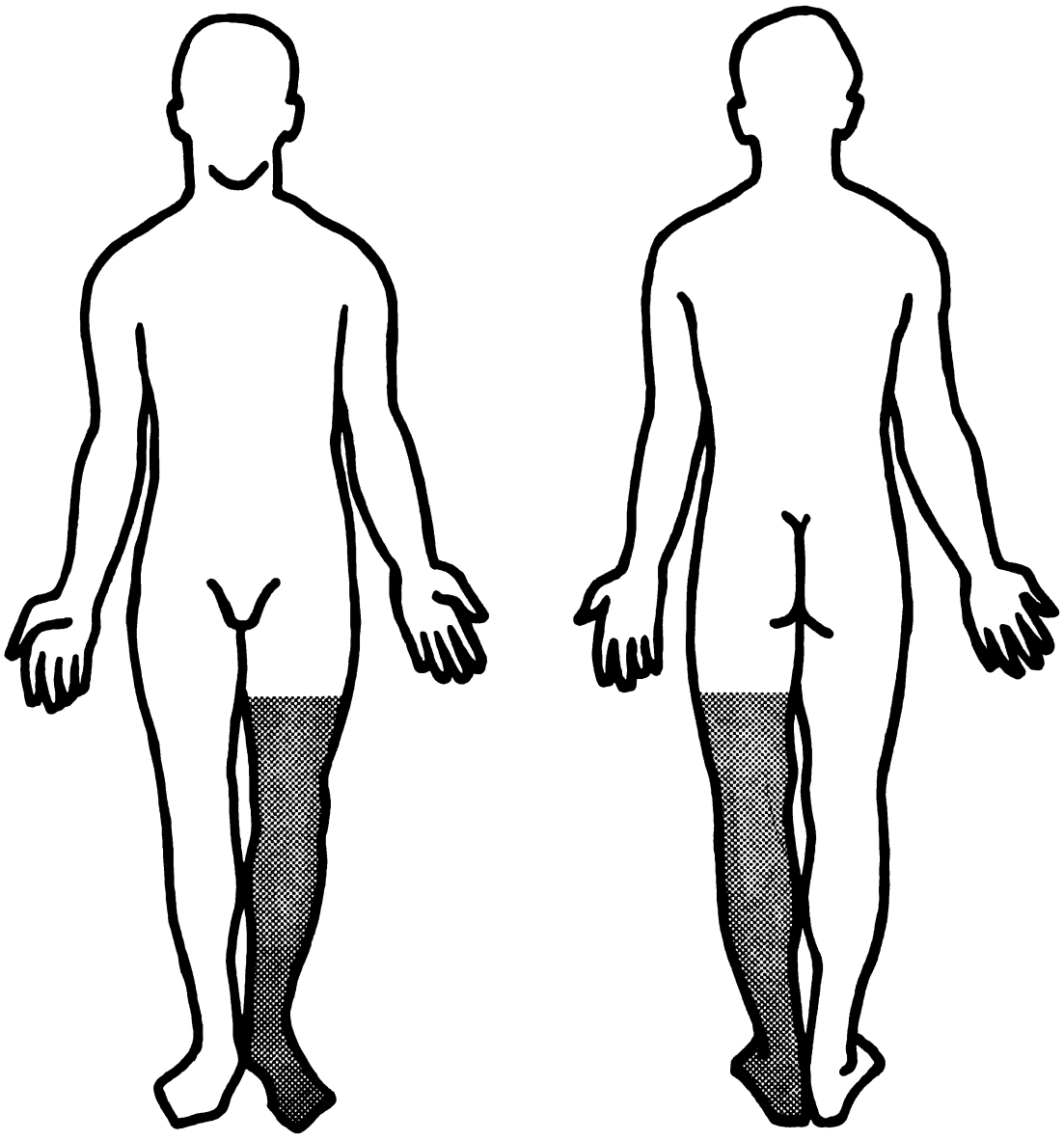

The prepared area should cover the circumference of the entire region from the mid thigh to the distal toes.

Figure C-15. Preparation for lower leg and foot surgery.
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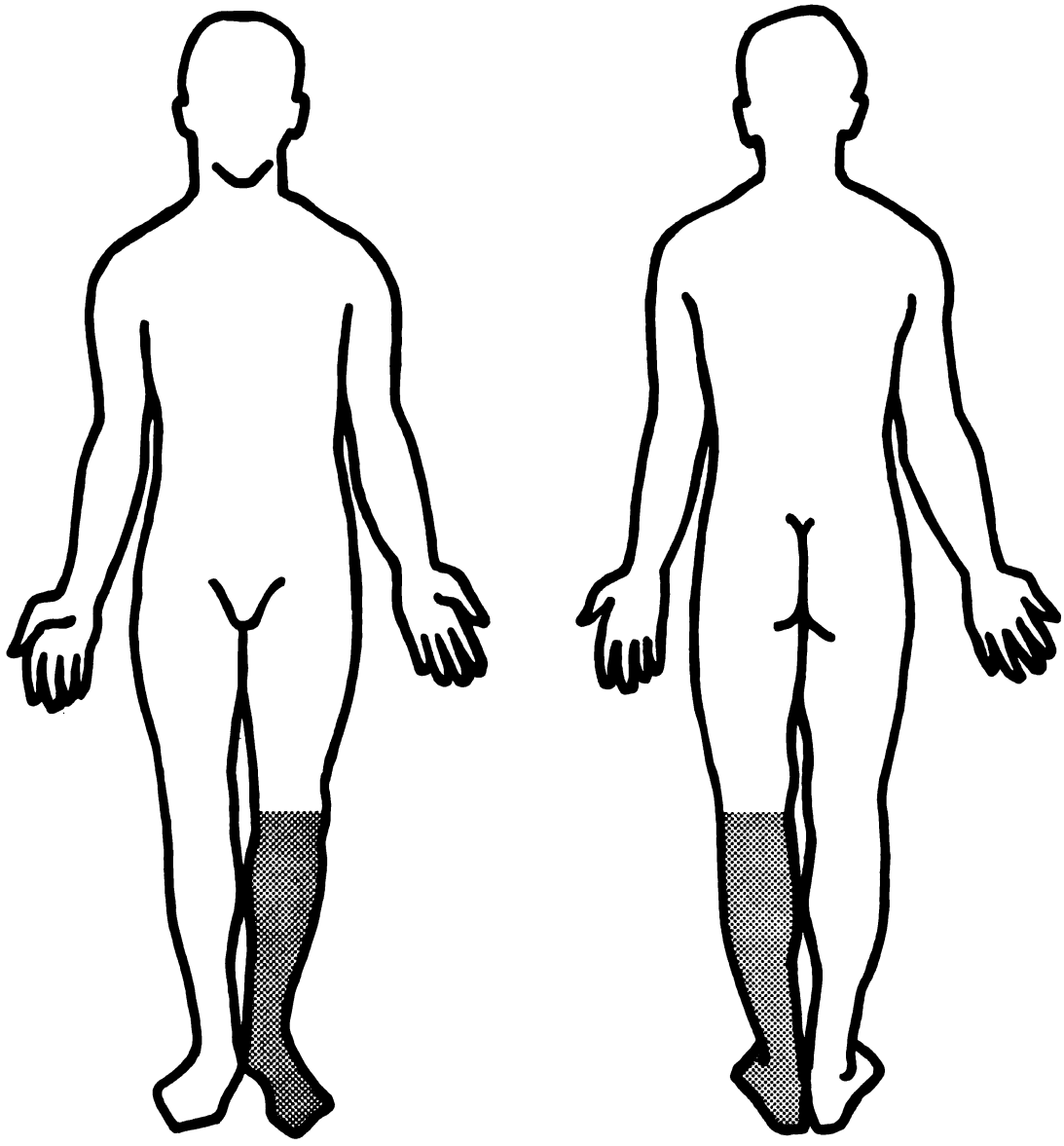

The prepared area extends from the knee and covers the circumference of the lower leg including the toes.

Figure C-16. Preparation for ankle, foot, or toe surgery.
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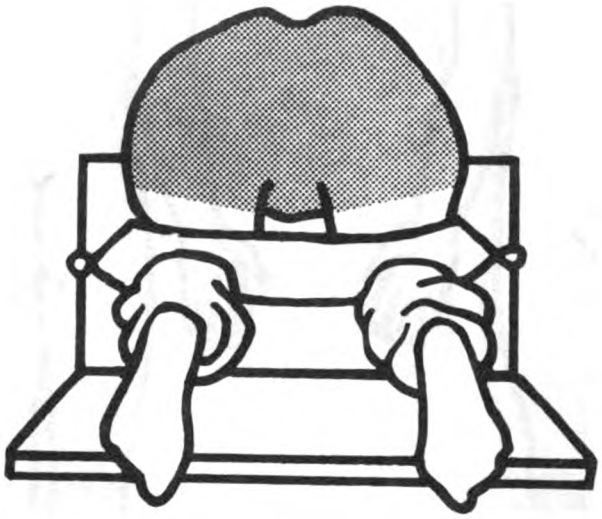

The prepared area includes the buttocks from the level of the iliac crest to the upper third of the thigh, including the anal region.

Figure C–17. Preparation for ano-rectal surgery.
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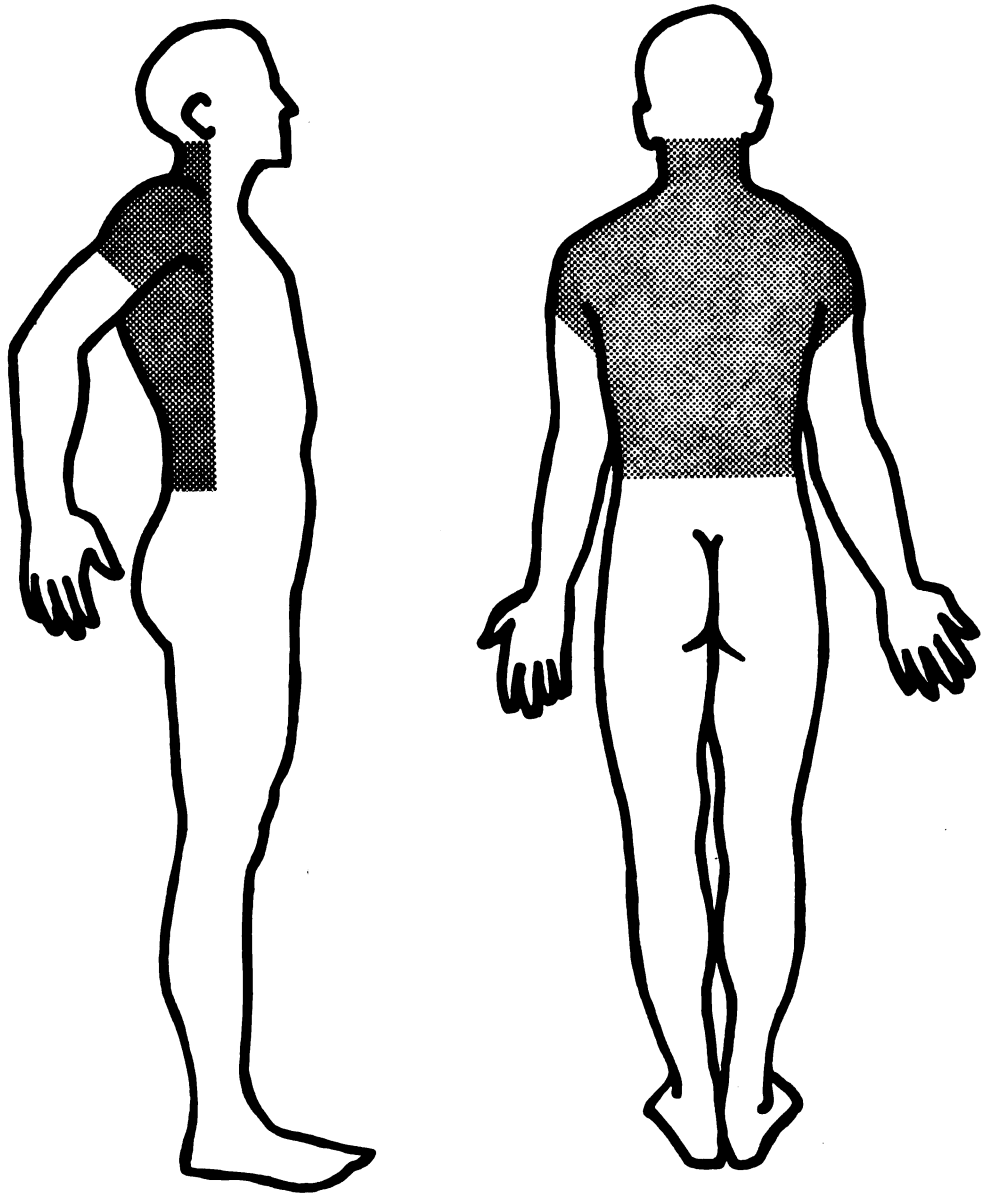

The prepared area extends from hairline to the waistline, including the shoulders and axillae. Laterally it extends to the bedline.

Figure C-18. Preparation for cervical laminectomy.
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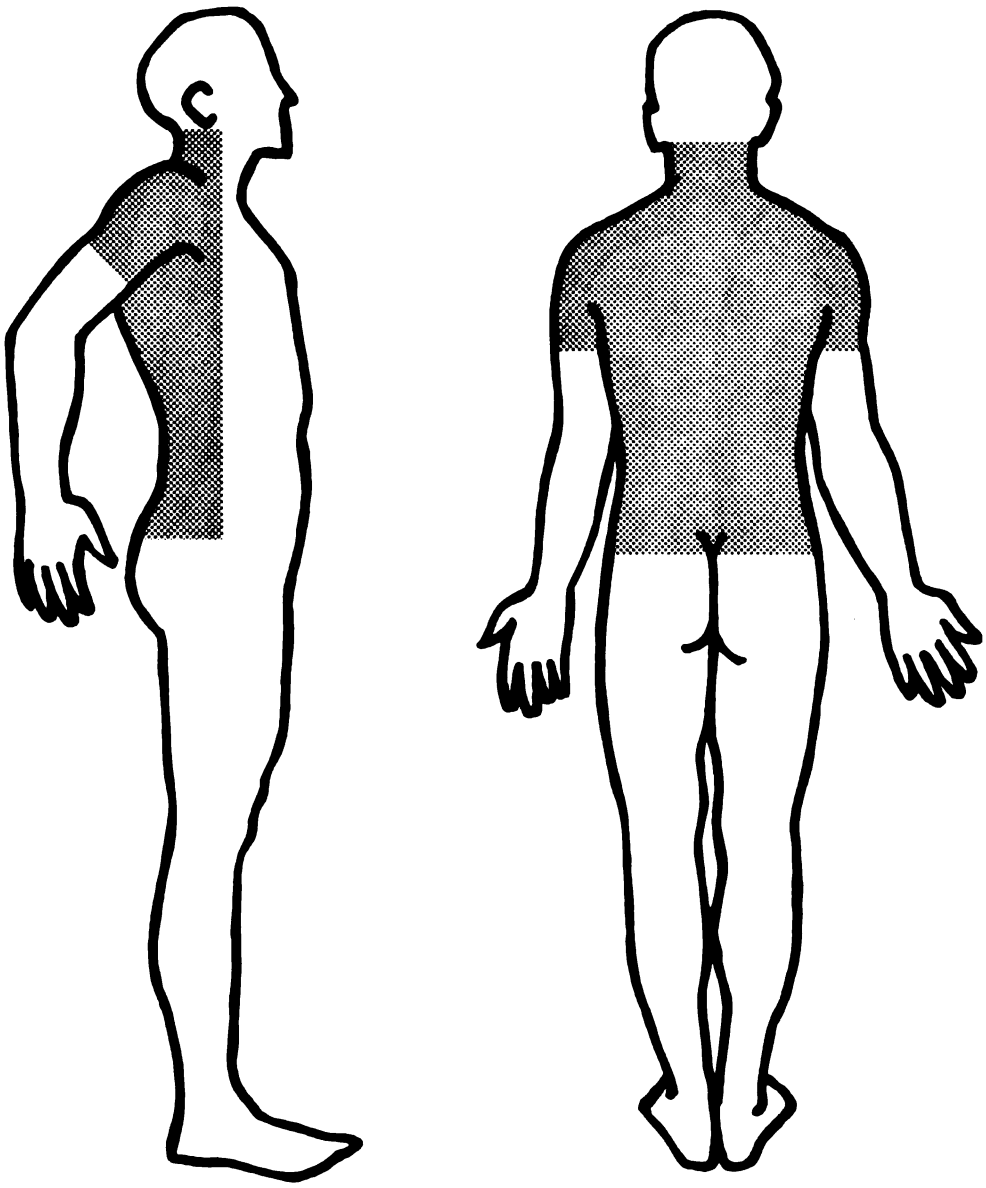

The prepared area extends from the hairline to the coccyx. It includes both shoulders and extends laterally to the bedline.

Figure C-19. Preparation for sympathectomy.
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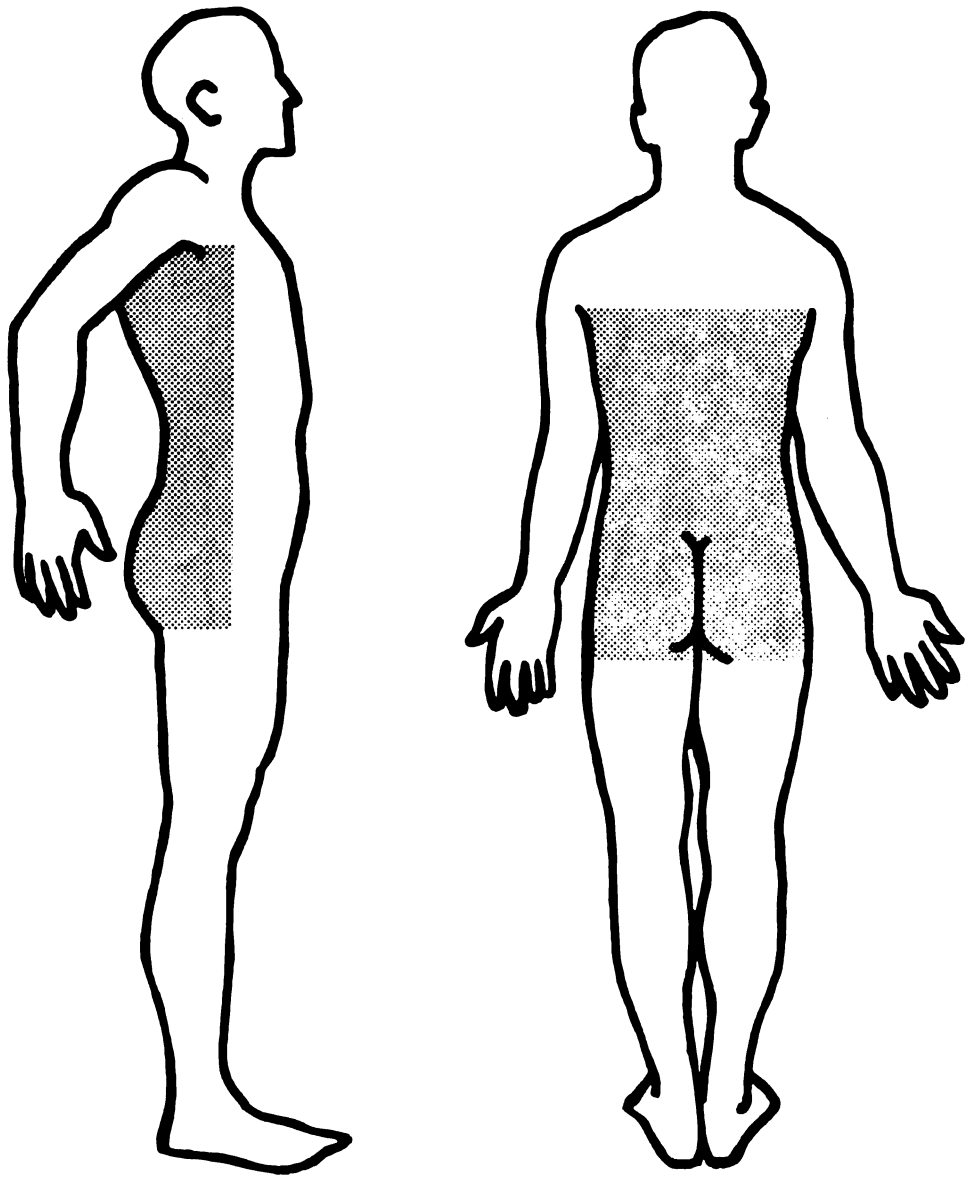

The prepared area extends from the level of the axillae downward to include the buttocks and anal region. Laterally it extends to the bedline.

Figure C-20. Preparation for lumbar laminectomy.
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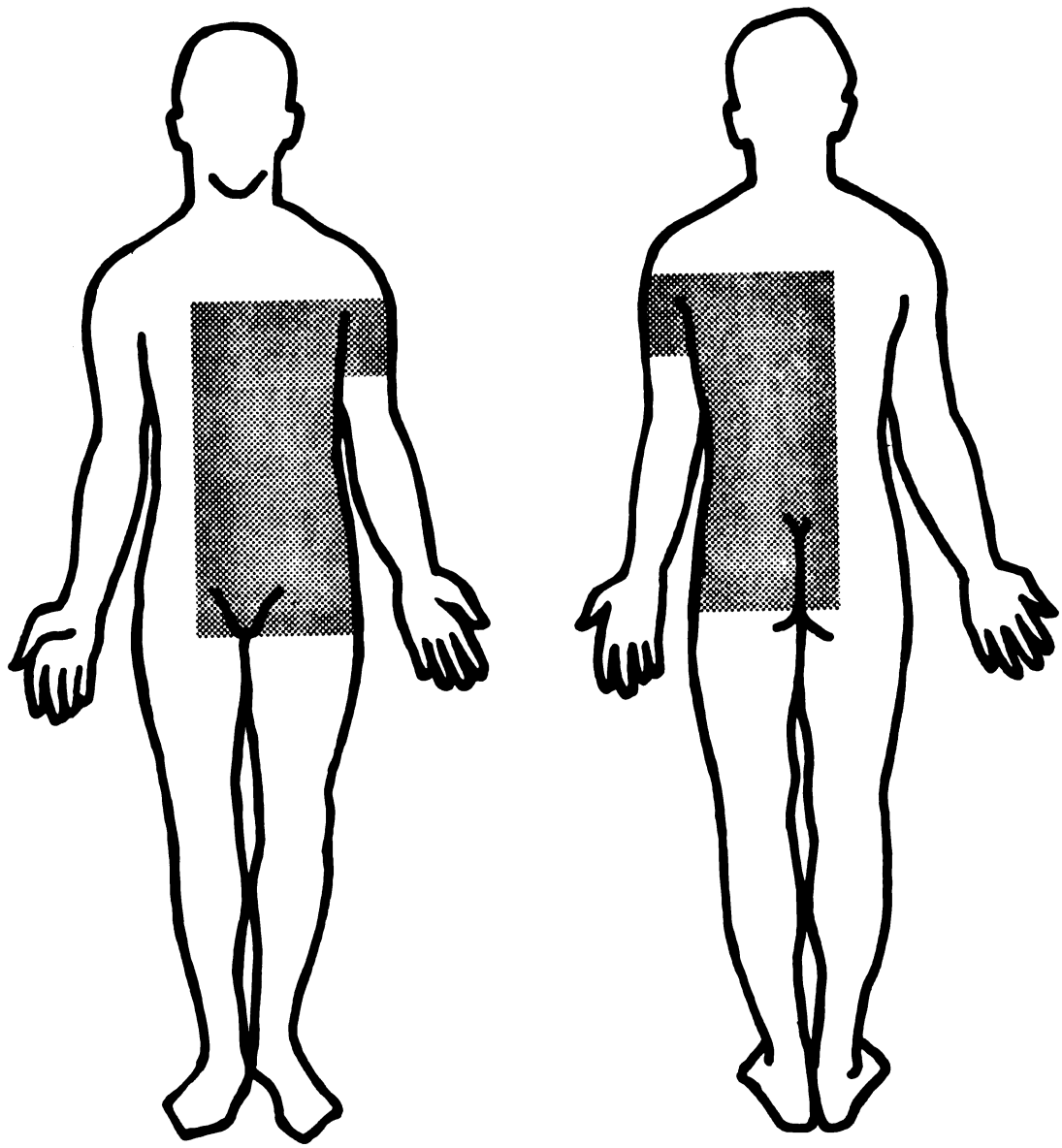

The prepared area extends anteriorly from above the level of the nipple to the upper thigh and includes the external genitalia. On the back it extends from the mid-scapula to the mid-gluteal regions.

Laterally the sternum and spine should be covered.

Figure C–21. Preparation for unilateral surgery of posterior lumbar region. (Copyright, The Purdue Frederick Company)

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By Order of the Secretary of the Army:

W. C. WESTMORELAND,
General, United States Army,
Chief of Staff.

Official:

KENNETH G. WICKHAM,
Major General, United States Army,
The Adjutant General.

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NG: State AG (3); Units same as active Army.

USAR: Same as active Army, except (1) to each unit.

For explanation of abbreviations used. see AR 310-50.

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